American Machinist

June 21, 1945

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A McGRAW-HILL PUBLICATION

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American Machinist Chips

British Surplus . . . Burnham Finney, *American Machinist's* Editor and Publisher, relates this interesting story of his recent testimony before the Senate Subcommittee on Surplus War Production.

One of Burnham's assignments was to describe the British plan for the disposal of surplus machine tools. He immediately got in touch with Bill Hargest at our London Office. In a week Bill had obtained the latest plans, gotten necessary clearance and sent them on to us.

Burnham's testimony on the plan was described by the head of the Subcommittee and by the British Supply Council in Washington as the best thing on the subject yet presented here.

It is through this same type of front-line reporting that all *American Machinist* editors strive to bring readers the latest and most accurate information available in the Metal-Working field.

Taxpayer's Lament . . . Last month it was announced by Aluminum Ore Company that a process developed in conjunction with the Army Air Forces is being used to extract pure aluminum from disabled and obsolete war planes.

This sounds like an extremely noteworthy project. However, as a plain, ordinary taxpayer thinking of the billions spent in building these planes, we can't help wondering how come they don't get pure gold out of them.

Keep 'em Rolling . . . War-expanded use of nonfriction bearings for both old and newly invented equipment promises to create a very bright spot in the postwar employment situation.

New machines and precision tools, new high-speed vehicles and many types of precision instruments depend on anti-friction bearings for efficiency. Diesel electrics and new high-speed steam locomotives are among the products taking more and more ball bearings.

New Departure Division of GM alone now is making more than 18,000 types and sizes of ball bearings.

Fact-Happy . . . As previously announced, the next (July 5) issue of *American Machinist* will feature our fifth 5-Year Inventory of Metal-Working Equipment. This report will be hotter than a firecracker, and you won't want to miss it.

The 1945 Inventory represents the most gigantic task ever undertaken by *American Machinist.* In attempting to measure the work that has gone into this job we asked the supervising editor if he had any comments on the subject. He looked at us with a dazed expression and in a few hours sent us the following memo. This is a little on the humorous side but it will give you some idea of the scope of this study . . . and partially explains how lots of editors die young.

"Dear Chips Editor:

The *American Machinist* 1945 Inventory has now been put to bed, and probably few statistical Goliaths have so plagued a poor, peace-loving editor. To demonstrate to our readers our tenacity and devotion to duty, I want to outline the wear and tear on our adding machines, calculators, pencils, erasers, ink-eradicators, midnight oil, statistical clerks, and an odd(!) editor or two:

Each of the 2,400 returns we received from the questionnaires we sent out had a possible 250 entries. The average return probably had some 100 entries in it, meaning that we started out with about 240,000 figures. The 240,000 figures were added into 180 sub-summaries, involving about 27,000 totals. These 27,000 totals were multiplied by 19 different expansion factors (each expansion factor involved about 50 figures, or a total of 950), and the multiplication gave us 27,000 expanded figures from the original totals.

These 27,000 entries were added by industrial groups, and by geographical groups, meaning 54,000 figures added in two different ways. These were then entered on the various master tables. The sub-totals on the various master tables represent addition of the 27,000 figures into 518 sub-totals. The grand totals represent the addition of the 27,000 entries into 62 such grand totals, and then the checking of the table by adding the 27,000 figures cross-wise into 160 horizontal totals. Over 184 percentages were calculated for the master tables.

To recap:

240,000	original figures
27,000	original sub-totals
27,000	multiplications
950	expansion factor figures
27,000	expanded figures
27,000	additions for industrial groupings
27,000	additions for geographical groupings
27,000	additions for sub-totals
518	sub totals
27,000	additions for grand total and checking
27,000	additions for horizontal totals
160	horizontal totals
184	percentages
Total 457,812	Figures

This does not include several additional thousands of changes necessitated by addition of late arrivals into the survey results."

BINGO!

(Chips Editor's Note: Bingo marks the spot where our Inventory Editor was found. Sic transit survey!)

Carbide Shells . . . It was recently revealed that the toughest man-made metal, tungsten carbide, is the effective armor-piercing "projectile within a projectile" of new-type anti-tank ammunition. The superhard core of carbide, weighing only a few pounds, is encased in a light shell of steel and aluminum which disintegrates upon striking the target.

Graham-Paige Motors Corporation is one of the companies making the new ammunition, which has been used overseas since the breakthrough at St. Lo.

BEVEL GEAR DRIVES — TO *Victory*

Photos Courtesy Packard

Ground Zerol Bevel Gear Planetary Reductions . . . for Marine Drives

FULL SPEED AHEAD

The Army Air Forces speedy rescue boats rely on ground Zerol planetary reductions to translate the power of their mighty engines into full speed ahead. Cut and ground on Gleason machines, Zerol bevel gears provide a smooth, dependable flow of power from engine to propeller, even under the terrific speeds and loads encountered in the fast, life-saving maneuvers of these craft in the roughest seas.

The Zerol planetary arrangement offers the advantages of a straight-line unit and can be used for reductions from approximately 1.5/1 to 2.5/1. Because the load is distributed simultaneously over several tooth contacts, it permits a lighter, more compact unit than can be obtained with ordinary single reduction gearing.

The localized tooth bearing characteristic of Zerol bevel gears aids in their assembly and compensates for minor deflections of the gears in operation. Grinding of the hardened, curved-teeth of these gears assures extreme accuracy and the complete uniformity of all teeth for maximum strength and durability.

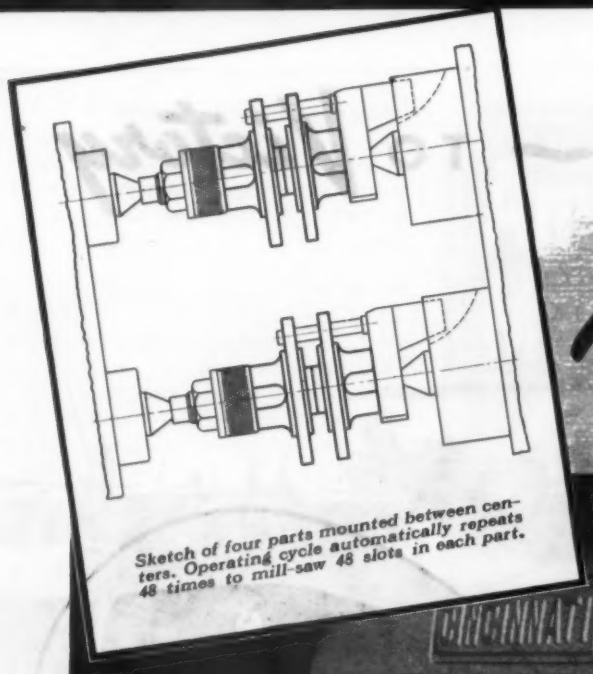
Investigate the advantages of Zerol planetary reductions for your gear drives by sending in prints to the Gleason Works. We will be glad to make recommendations and prescribe machines for manufacturing the gears.

GLEASON

GLEASON WORKS

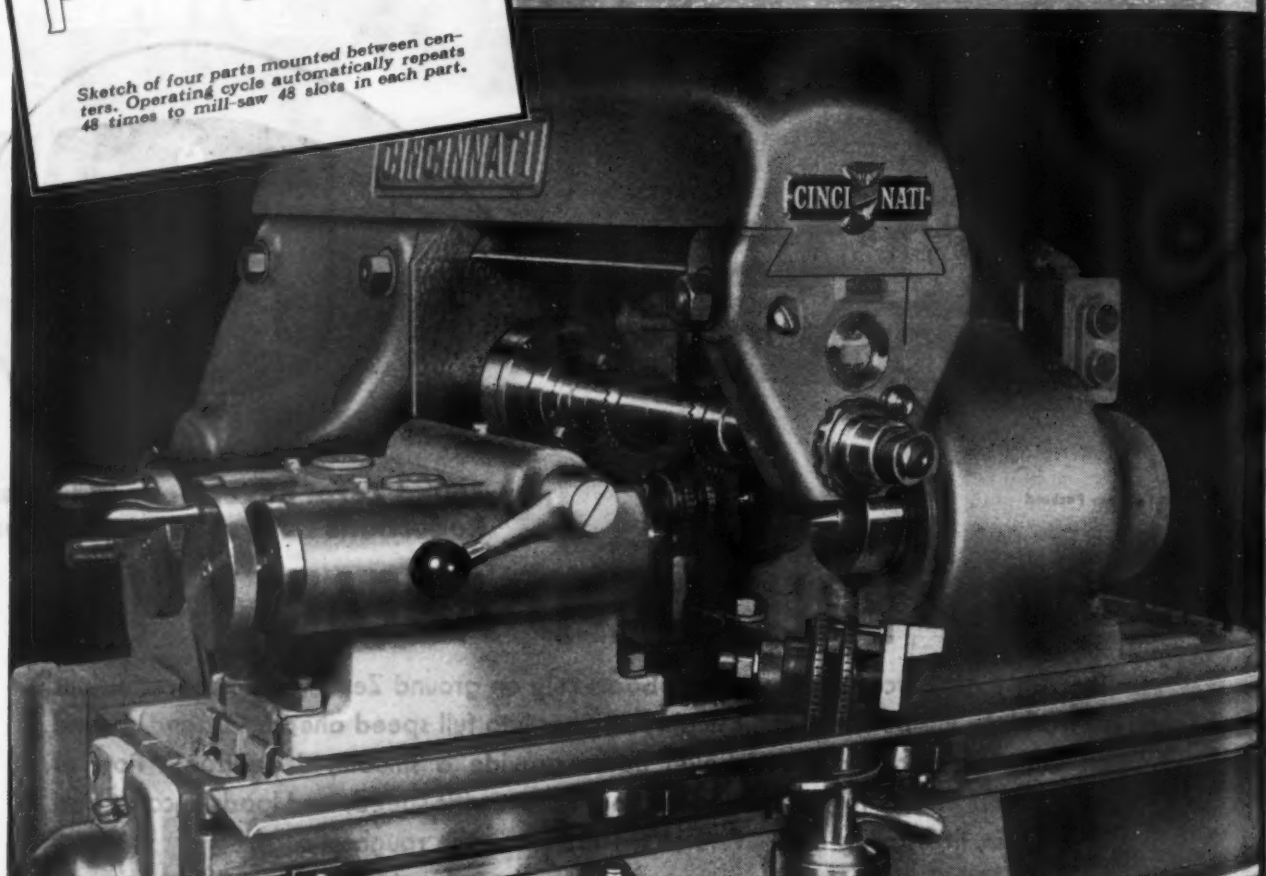
Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER 3, N. Y., U. S. A.



Sketch of four parts mounted between centers. Operating cycle automatically repeats 48 times to mill-saw 48 slots in each part.

It's completely a



Setup for the mill-saw operation described on the opposite page. The machine is a **CINCINNATI** *1-18 Plain Automatic Miller equipped with a special two-spindle Automatic Indexing Fixture. Work has not yet been loaded in the forward station of the fixture. The parts are torus hubs for hydraulic drive in a transmission.*

It's the lucky seventh
BUY AN EXTRA BOND!

THE CINCINNATI M

MILLING MACHINES

automatic

MILLING 48 SLOTS IN 4 PARTS

at one setting!

Just imagine the time that can be saved by rapidly advancing to and retracting the work from the cutter at 300″ per minute, and automatically indexing the work 48 times to mill-saw 48 slots. Multiply this time saving by four and you get some idea of the savings effected by the equipment illustrated at the left. The machine is a CINCINNATI No. 1-18 Plain Automatic Miller, tooled up by Cincinnati Application Engineers with a two-spindle Automatic Index Fixture for milling 48 slots in torus hubs. Each mandrel between the centers of the fixture holds two parts, making a total of four milled each loading. A cam controlled ratchet device (located at rear of fixture) and a spring lock take care of the automatic indexing. The operator merely loads the two mandrels, places them in the fixture, and starts the machine. *It automatically mill-saws 48 slots and then stops.* ¶ Investigate the 1-18 Automatic for your milling operations. You'll find that the operational features and rugged construction of this milling machine make it possible to handle a wide range of parts quickly, accurately and economically. Our engineers will be glad to talk over your milling problems and give you the benefit of their many years' experience.

CINCINNATI *1-18 Plain Automatic Miller. Complete information and specifications may be had by writing for Catalog M-848. Sweet's Catalog File for Mechanical Industries gives a brief description of this machine.*

CINCINNATI

MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

Etienne

you wouldn't

lift a 500 pound load with a 100 pound capacity rope

It is just as foolish to put carbide cutting tools on an out-moded lathe. Carbide tools have increased horsepower requirements as much as 300 per cent.

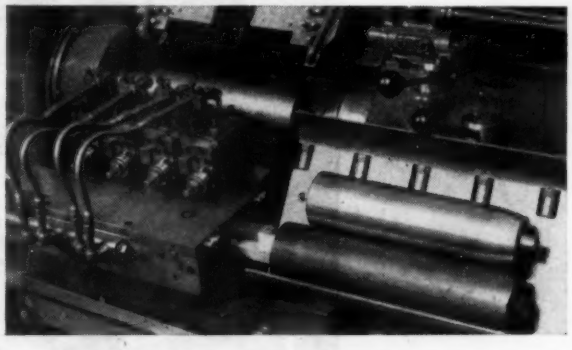
Modern Jones & Lamson Lathes are designed specifically to carry this extra load, and more. They have the power, they have the rigidity, they are easy to operate.

FOR PRODUCTION MEN THE BIGGEST BATTLE LIES AHEAD—the battle of costs. Our jobs, and our earnings, as well as profits, will depend upon maximum production from the most efficient machines.

Now is the time to check your equipment. Plan now to scrap obsolete machines and replace them with good War Surplus machines or new machines. Our engineers will be glad to assist you.

What HORSEPOWER Are You Using?

The 16" Fay Automatic Lathe that is rough turning this 105 millimeter shell has to transmit *from 75 to 100 horsepower* to do this job on a production basis and take full advantage of the fast cutting carbide tools.



Engineered to "Carry the Load" for Most Productive Operation With Carbide Cutting Tools

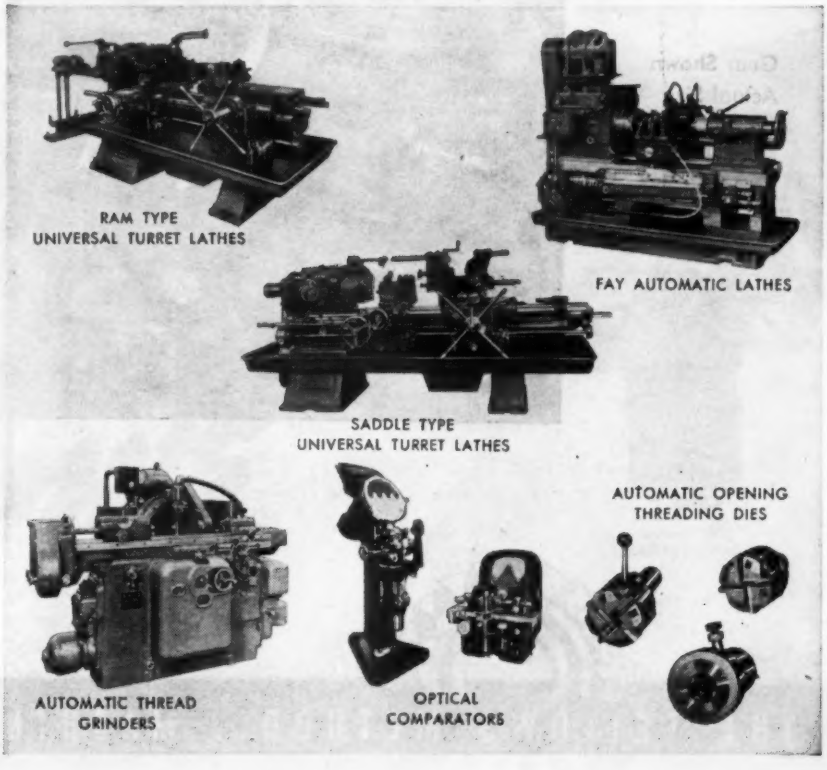
Fay Automatic Lathes

JONES & LAMSON

MACHINE COMPANY

SPRINGFIELD, VERMONT, U. S. A.

Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.



Tough Problem GEARS C

WITH THE FI

Gear Shown
Actual Size

ESSENTIAL DATA

★

WORK: 100 tooth Internal gear of 7.575 diametral pitch, 25° pressure angle, 13.200 inches pitch diameter.

CUTTING: On Fellows 6A-Type Gear Shaper—to 0.003 inch on tooth thickness.

SHAVING: On *Fellows No. II Internal Gear Shaving Machine* (illustrated) Time: 2 minutes, 20 seconds per gear.

INSPECTION: On Fellows "Red Liner" and Fellows Involute Measuring Instrument.

LAPPING: On Fellows LS-Type Gear Lapping Machine.

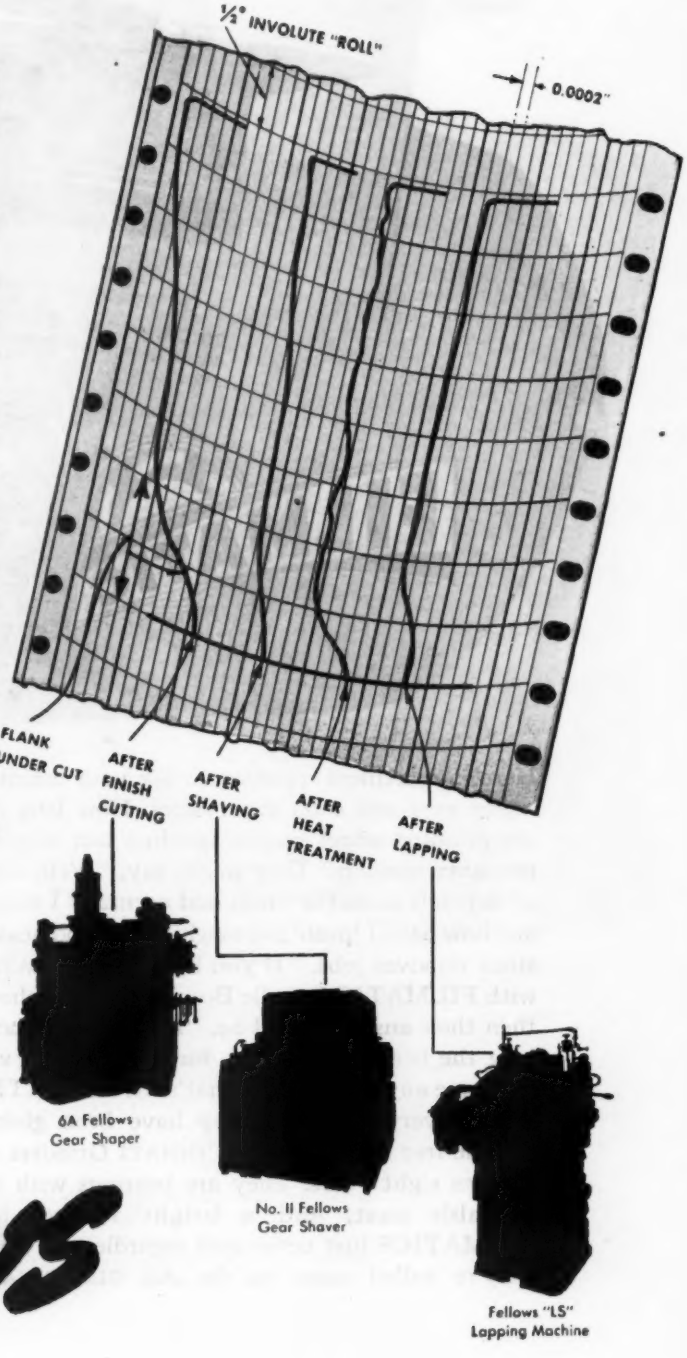
THE FELLOWS METHOD...MACHINES AND TOOLS FOR

RS COME UNDER Control

E FELLOWS METHOD

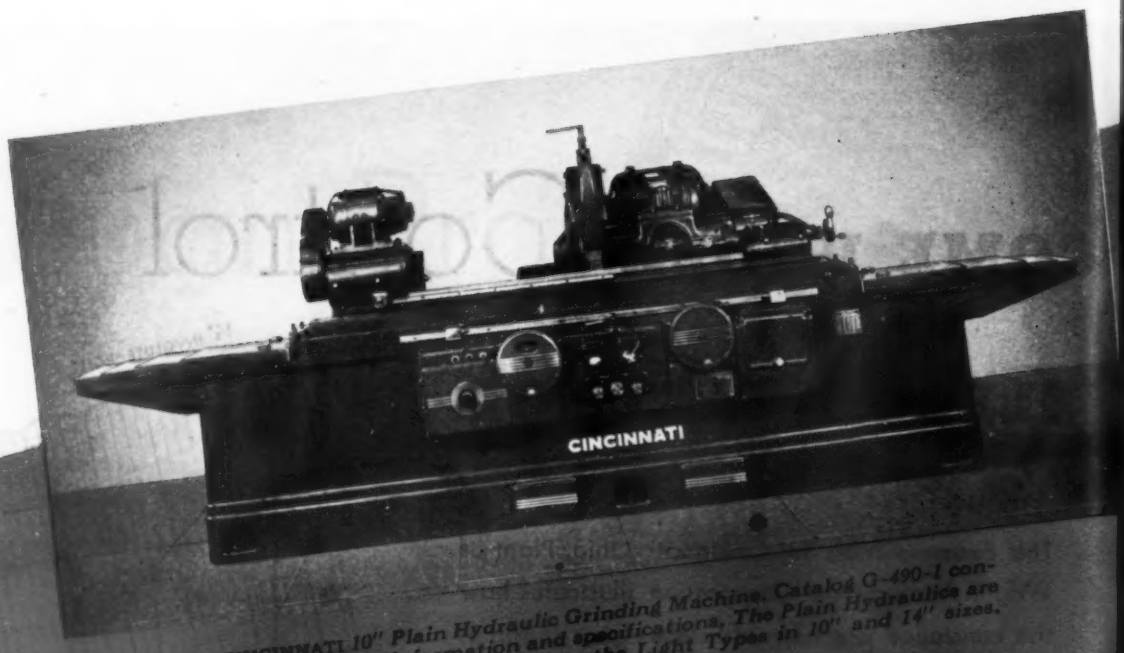
This Example from the Cincinnati, Ohio, Plant of *Wright Aeronautical Corporation* illustrates how the *controlled* precision of Fellows gear shaping, shaving, and lapping are coordinated to work *with* the known distortion which the teeth will undergo in the hardening fire . . . The teeth are purposely cut *"off"* pressure angle, to a tolerance which leaves for the Fellows No. II Internal Gear Shaving Machine (illustrated) the removal of only 0.0015 inch of stock from each side of the tooth—thus prolonging the effective life of the shaving tool . . . After hardening, a Fellows lapping operation most effectively restores the gear to its after-shaving perfection of tooth profile. The accompanying chart of this gear made on the Fellows Involute Measuring Instrument "tells the story".

"The Fellows Method" Catalog on request. The Fellows Gear Shaper Company, Springfield, Vermont—or 616 Fisher Bldg., Detroit 2, Mich., or 640 West Town Office Bldg., Chicago 12, Illinois.



Fellows

ALL OPERATIONS FROM BLANK TO FINISHED GEAR



CINCINNATI 10" Plain Hydraulic Grinding Machine. Catalog G-490-I contains complete information and specifications. The Plain Hydraulics are available in 4", 6" and 10" sizes; the Light Types in 10" and 14" sizes.

FILMATIC

The bearing with a

Here's a pertinent question to ask your maintenance men and shop supervisors: How long do the grinding wheel spindle bearings last in your precision grinders? They might say, "Well, that all depends upon the finish and accuracy I want, and how hard I 'push' the machine to grind heavy stock removal jobs." If you have CINCINNATI's with FILMATIC Spindle Bearings in your shop, then their answer would be, "I don't know how long the bearings will last, for they have never given me any trouble." ¶ That's the FILMATIC record everywhere, for they have been giving trouble-free service on CINCINNATI Grinders as long as eight years. They are bearings with an enviable past, and a bright future, for FILMATICS just never quit regardless of what they're called upon to do. All CINCINNATI Grinders are now equipped with FILMATIC Bearings, and you have a wide choice of these efficient and productive machines.

Centertypes—4", 6" and 10" Plain Hydraulic, 10" and 14" Light Type Plain Hydraulic, 14", 16", 20", 24" and 28" Plain Self-Contained; 12", 14", 16" and 18" Hydraulic Universals.

Centerless—Nos. 2, 3 and 4, and Centerless Lapping Machines.

You can't afford to overlook the advantages of CINCINNATI Grinding Machines with FILMATIC Spindle Bearings. The complete story of this unusual bearing may be found in booklet G-446. Write for your copy today.

It's the lucky seventh
BUY AN EXTRA BOND!

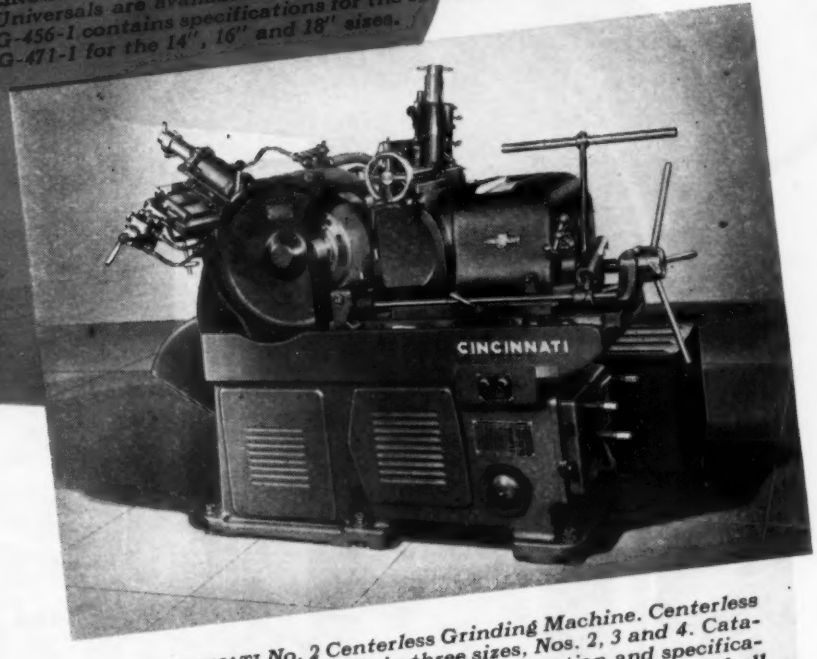
CINCINNATI

CENTER TYPE GRINDING MACHINES

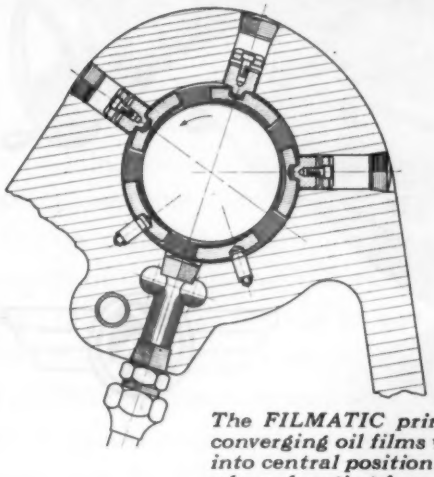
CINCINNATI

CINCINNATI 12" x 36" Hydraulic Universal Grinder. The Hydraulic Universals are available in 12", 14", 16" and 18" sizes. Catalog G-456-1 contains specifications for the 12" Grinder, and Catalog G-471-1 for the 14", 16" and 18" sizes.

FUTURE!



CINCINNATI No. 2 Centerless Grinding Machine. Centerless Grinders are available in three sizes, Nos. 2, 3 and 4. Catalog G-456-2 contains complete information and specifications. Sweet's Catalog File gives a brief description of all CINCINNATI Grinding and Lapping Machines.



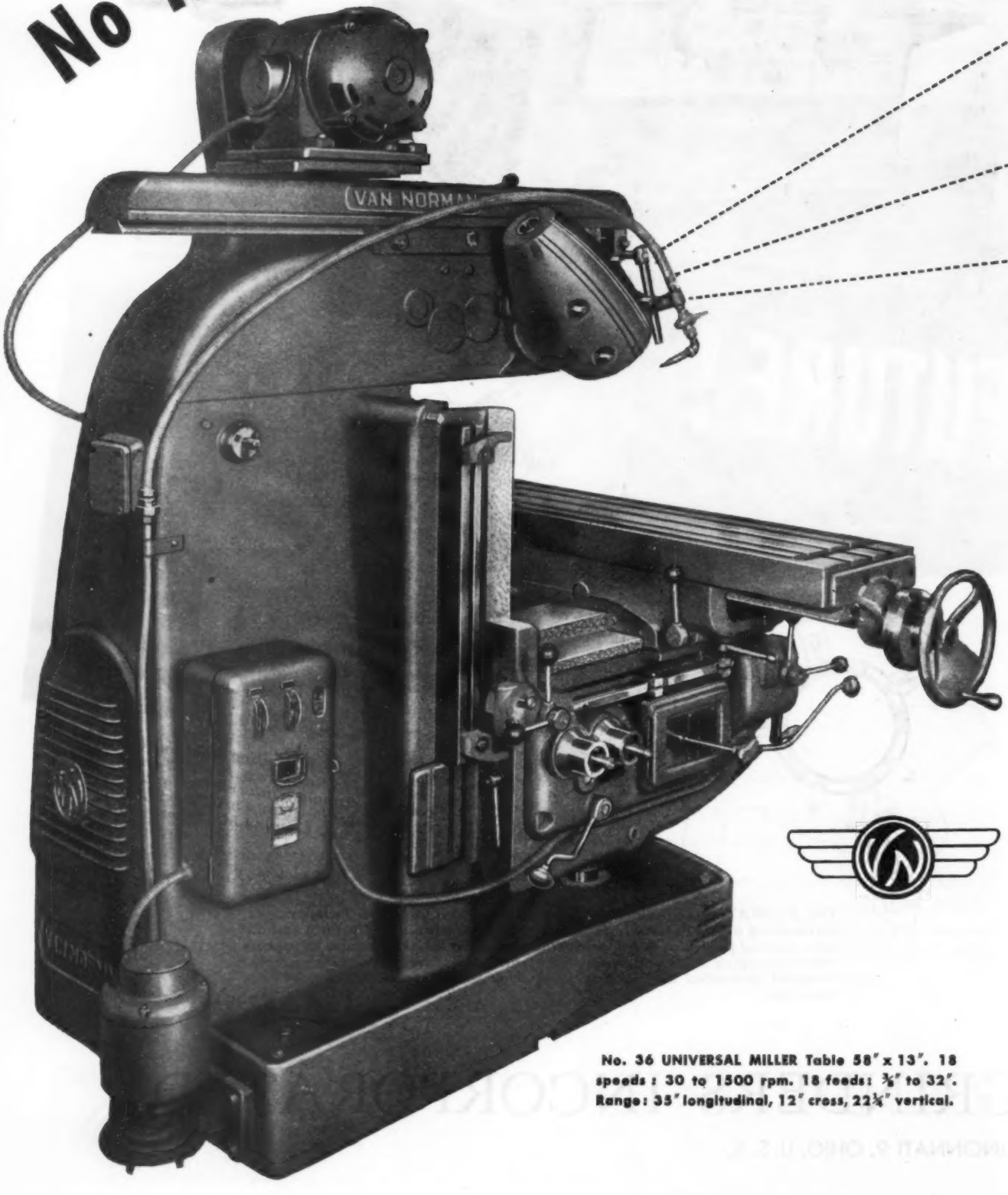
The FILMATIC principle. Self-adjusting shoes produce independent, converging oil films which develop high radial pressures, forcing spindle into central position. A few advantages are: No breakdown; no adjusting when changing from roughing to finishing cuts; greater accuracy; metal removal increased as much as 30% over machines with conventional bearings.

GRINDERS INCORPORATED

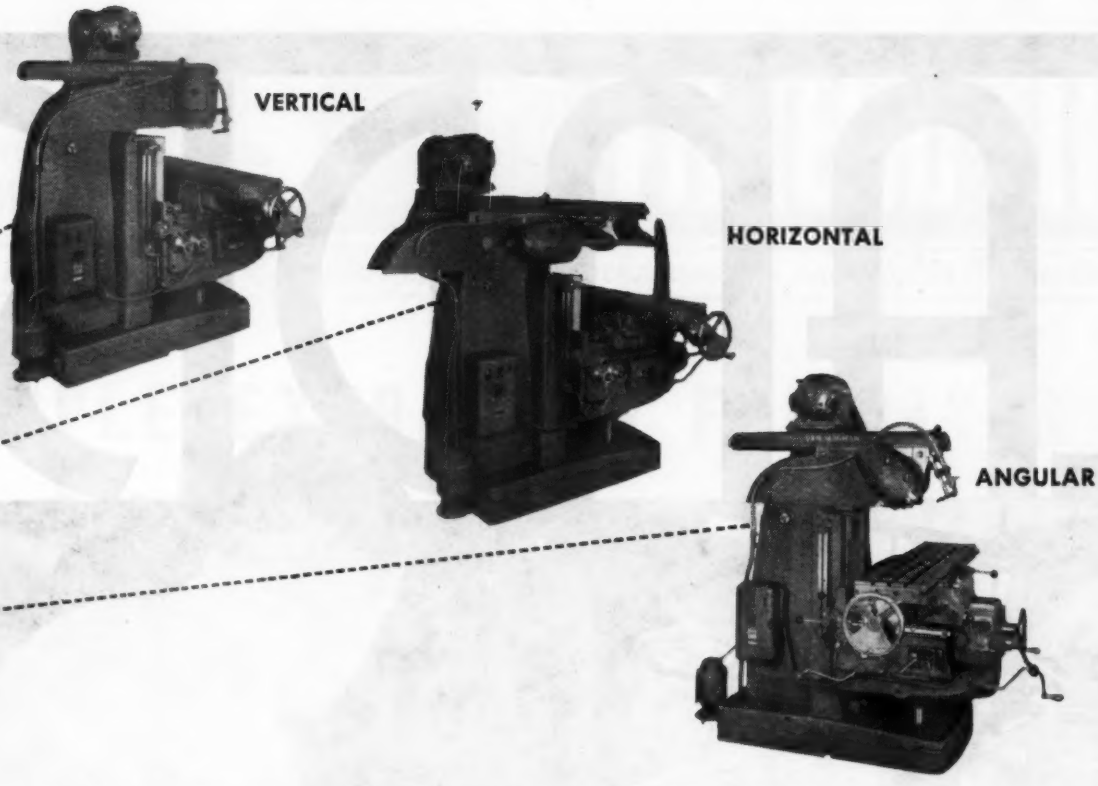
CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

No Reconversion Problems



No. 36 UNIVERSAL MILLER Table 58" x 13". 18 speeds: 30 to 1500 rpm. 18 feeds: ⅜" to 32". Range: 35" longitudinal, 12" cross, 22¾" vertical.



...with VAN NORMAN Ram-Type Millers on the job

Here's a milling machine that not only meets today's war requirements but will also be ready to use when you *reconvert*, tomorrow . . . because the adjustable cutterhead makes it adaptable to many jobs. This means that no matter what your milling jobs are . . . horizontal, vertical or angular . . . they can be produced on Van Norman Ram-Type Millers. The result is no idle machine time, a daily profit from continuous machine operation and greater miller production capacity. And that's not all . . . the versatility of the swiveling cutterhead permits many jobs to be carried through to completion without changing the original work set-up with subsequent reduction of rejects through more accurate work.

In addition, Van Norman Ram-Type Millers provide such additional advantages as front and rear control of all power and manual feeds which give operators complete control of the operation whether they are at the front or rear position. The moveable ram, in combination with the saddle movement, increases the working capacity of the machine. The sturdy heavy-duty column, knee and saddle assure rigidity for extreme accuracy. The single lever feed selector permits quick, easy selection of the proper feed required for the cutting operation. Other advantages such as large easy-to-read dials, conveniently located speed selector, rugged over-arm, 6-way rapid traverse and new heavier ram all assure accuracy, ease of operation and cost-cutting production.

Investigate Van Norman Ram-Type Millers today. See for yourself how these machines will do your work today *better* . . . and solve your milling machine reconversion problems as well.

VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

"It pays to Van Normanize"

LANDIS

THREADING MACHINERY

THREAD CUTTING
DIE HEADS

COLLAPSIBLE
TAPS

Greater Accuracy
Higher Production
at Lower Cost....
Write for Catalog

LANDIS MACHINE COMPANY

A Good Mechanic Knows and Cares For His Machine

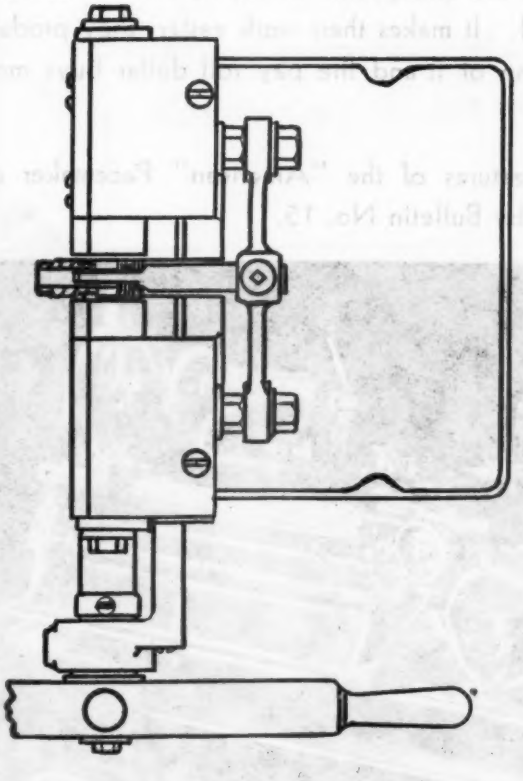
LANDIS REG. U.S. TRADE—MARK PAT. OFF.

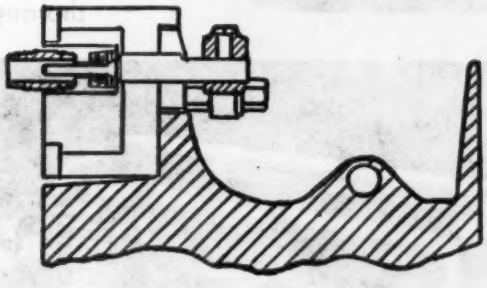
THREAD TIPS

In the Interest of Efficiency, Better Workmanship and Higher Production

NIPPLE EXTRACTOR FOR 1¼" & 2" PIPE AND NIPPLE MACHINE

GRIPS MUST BE CUT OUT TO CLEAR BAR AS SHOWN





1 KNOCKOUT BAR FOR ½ TO ¾ PIPE

1 KNOCKOUT BAR FOR 1 TO 2 PIPE

REGULAR NIPPLE GRIPS CAN BE USED BY GRINDING CLEARANCE FOR KNOCKOUT BAR AS SHOWN ABOVE.

SPECIAL CARRIAGE FRONT CLAMP BOLTS MUST BE USED.

THIS FIXTURE CAN BE FURNISHED FOR REGULAR PIPE AND NIPPLE AND LANDMACO MACHINES.

NIPPLE IS PREVENTED FROM STICKING IN GRIPS WHEN VISE IS OPENED BY KNOCKOUT BAR.

Be Threadwise—Employ LANDIS Long Life Tangential Chasers

WAYNESBORO, PENNSYLVANIA, U.S.A.

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

27 Spindle Speeds

with only 2 *control levers*

Convenience of control and ease of operation are two of the outstanding characteristics of the new "American" Pacemaker Lathe.

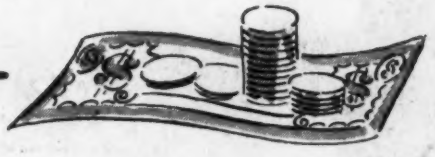
Imagine being able to secure any one of 27 spindle speeds thru only 2 conveniently placed direct reading levers without having to refer to index plates or having to retain lever positions in one's mind. Operators are enthusiastic in their praise of this new speed control. It makes their work easier; they produce more work because of it and the pay roll dollar buys more as a consequence.

This and other fine features of the "American" Pacemaker are thoroughly covered by Bulletin No. 15.

THE AMERICAN TOOL WORKS COMPANY

LATHES AND RADIAL DRILLS

CINCINNATI, OHIO, U. S. A.

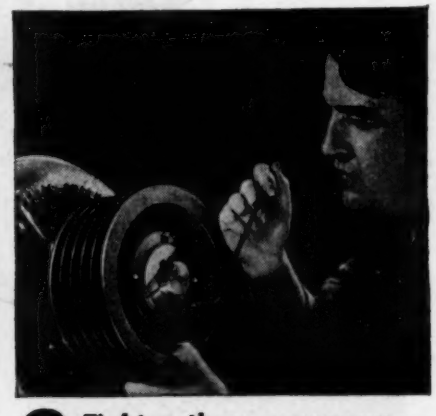
Trade this for this ; save and 

No more *forcing* of sheaves. Simple wrench operates Allis-Chalmers' "Magic-Grip" — *fastest mounting and demounting sheave on the market.* Saves time, money.

SEE HOW QUICKLY, EASILY THIS NEW SHEAVE MOUNTS AND DEMOUNTS

1 Place sheave on shaft. Slides on smoothly because clearance is provided by expanded bushing. There's *no* hammering — *no* forcing! Complete sheave and bushing unit comes intact—ready for quick, easy mounting.

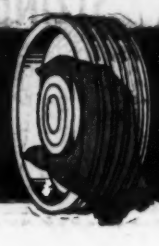
2 Slide to desired position. Sliding easily, sheave can be placed *exactly* according to straight-edge ... giving you true alignment with resulting smooth performance. A minimum of time is required.



3 Tighten three capscrews — and it's ready to go! Entire sheave is locked securely to shaft and *grips like magic!* No set screws to damage shaft. Send for Bulletin B6310. Allis-Chalmers, Milwaukee 1, Wis.

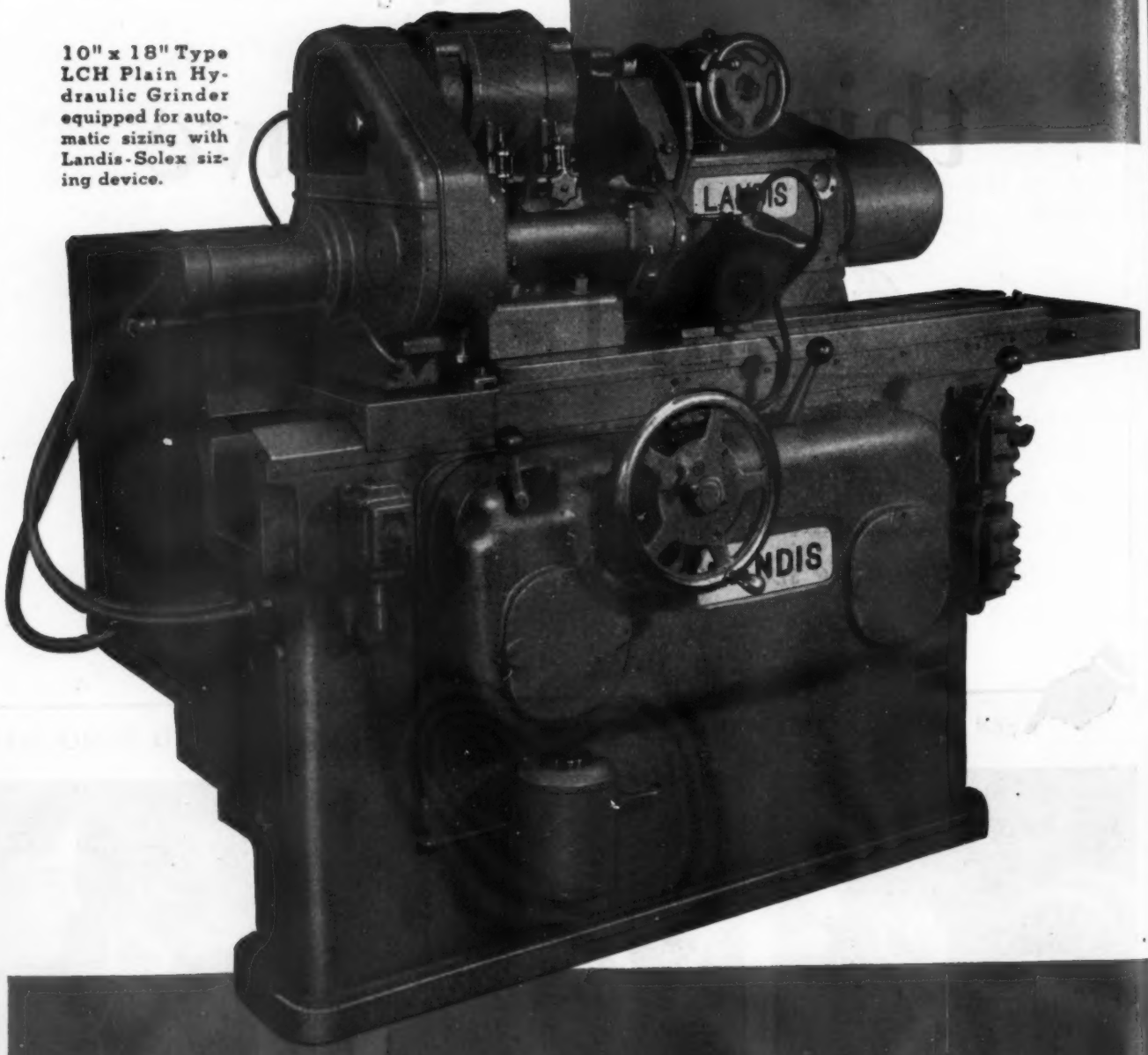
A 1855

Allis-Chalmers Texrope

"MAGIC-GRIP"  SHEAVES

How

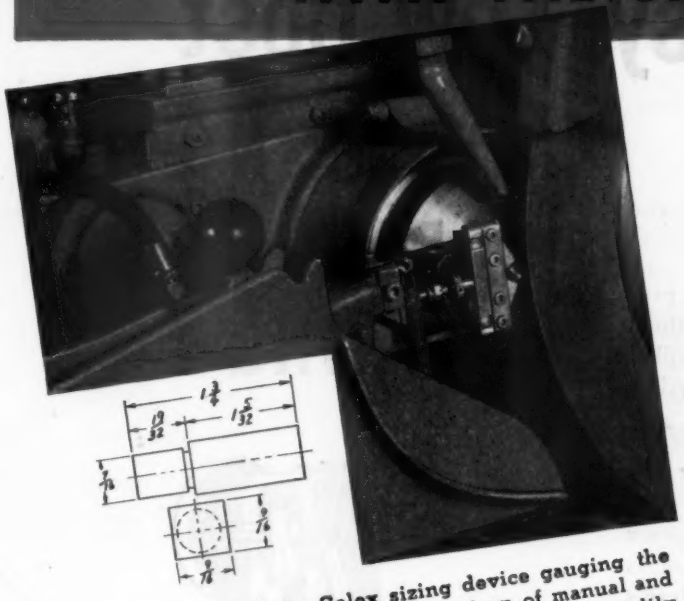
10" x 18" Type LCH Plain Hydraulic Grinder equipped for automatic sizing with Landis-Solex sizing device.



1 MAN + 2 MACHINES + AUTOMATIC SIZING } EQUALS { 2 MEN AND 2 MACHINES

Automatic Sizing

DOUBLED GRINDER PRODUCTION WITH THE SAME MANPOWER



Closeup of Landis-Solex sizing device gauging the part shown in the sketch. Comparison of manual and automatic operations shows how a man can readily handle two machines.

MANUAL

1. Chucks Work
2. Moves Sizing Device In Place
3. Starts Work Rotation And Rapid Infeed
4. Unchucks Work

AUTOMATIC OPERATION

1. Controls Feed
2. Brings To Size
3. Returns Wheelbase
4. Returns Rapid Infeed Lever
5. Stops Coolant Flow
6. Stops Work Rotation

The automatic sizing device was developed by LANDIS TOOL engineers for high production grinding jobs or long production runs. Its application to the machine illustrated is typical of how LANDIS TOOL engineers provide a specific solution to grinding problems.

An exclusive LANDIS TOOL development, the Landis-Solex sizing device controls all the necessary grinder movements. It is only necessary for the operator to load and unload. No attention is required during the grinding cycle. One operator can handle two machines and work to tolerances of .0003" on ordinary work. Since sizing is done from work diameter, accuracy is independent of wheel wear, amount of stock removed or wheel dressing.

For help in solving your grinding problems call on LANDIS TOOL for a custom engineered solution.

LANDIS TOOL COMPANY
WAYNESBORO • PENNA.

LANDIS TOOL
Precision Grinders

YOU GET CORROSION RESISTANCE

Plus... Easy, Low Cost

STAMPING
FORMING
DRAWING

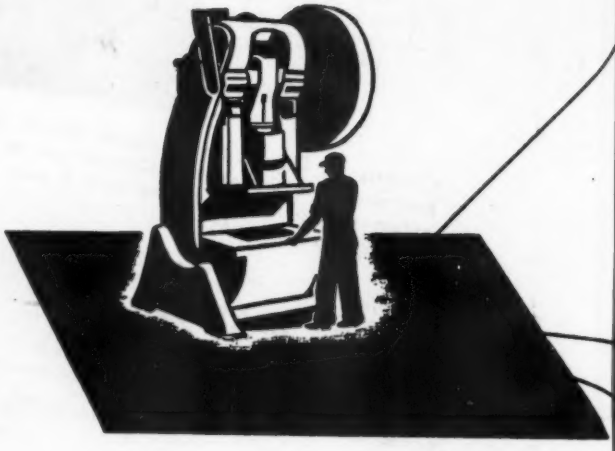
Have you considered the greater utility advantages you can get by using Stainless Steel in your products?

For instance, you can give your products positive protection against heat and corrosion; you can provide them with 50% greater strength than ordinary cold-rolled steel; you can choose from a wide range of physical properties to meet specific requirements.

Just be sure when you select a Stainless Steel that you get one that works easily and economically in your fabricating shop. Carpenter, for instance, has spent years of intensive research developing soft and ductile Stainless Strip that blanks cleanly, forms readily, deep-draws easily. Exacting control through every step in manufacture, gives this Stainless Strip the consistent uniformity, lot after lot, that pays off in faster production runs with fewer rejects and less die wear.

Let our diversified Stainless experience help you to solve your specific problems. Call in your nearby Carpenter representative and let him help select the Stainless Strip that will make your production job easier and build extra service life into your products. See him today or write us at the mill.

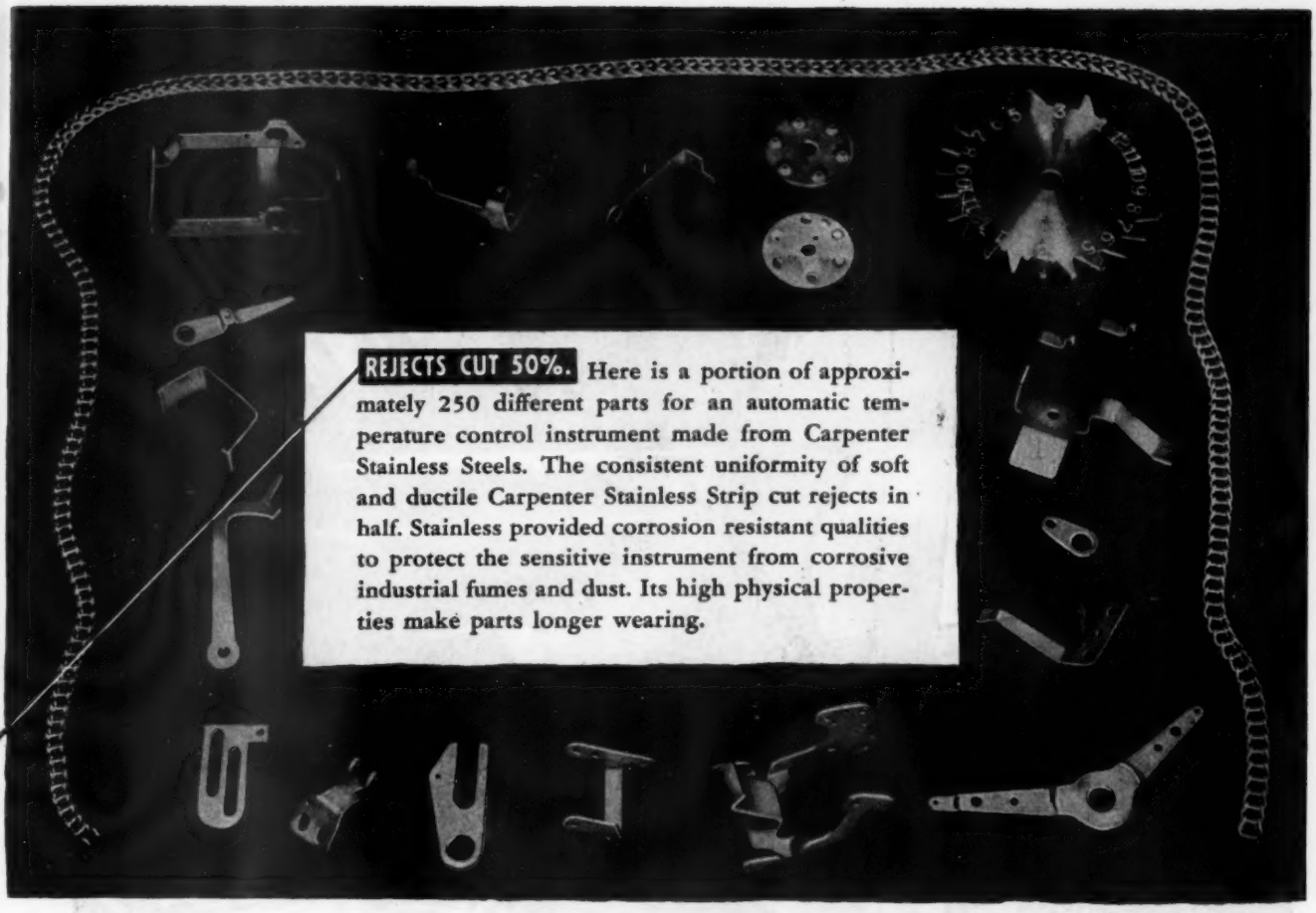
And if you do not already have a copy of "Working Data for Carpenter Stainless Steels," drop us a line on your company letterhead, indicating your title.



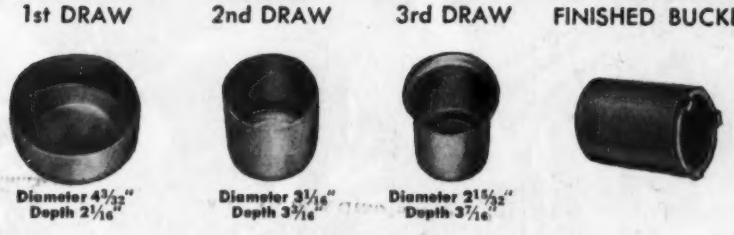
Give Your Products These Advantages . . . With CARPENTER Stainless

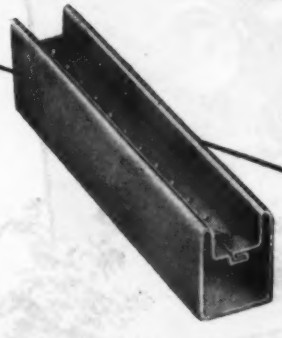
- Strength and Rigidity
- Heat Resistance
- Weight Saving
- Freedom from Rust
- No Plating to Peel
- Ease of Assembly
- Longer Product Life
- Sales Appeal

more than corrosion resistance



REJECTS CUT 50%. Here is a portion of approximately 250 different parts for an automatic temperature control instrument made from Carpenter Stainless Steels. The consistent uniformity of soft and ductile Carpenter Stainless Strip cut rejects in half. Stainless provided corrosion resistant qualities to protect the sensitive instrument from corrosive industrial fumes and dust. Its high physical properties make parts longer wearing.





NO PROCESS ANNEALING was needed to deep draw this steam trap bucket. Have you considered the economies you can gain and the trouble you can avoid by making your deep drawn parts from easy-working Carpenter Stainless Strip?

TOUGH PROBLEM SOLVED. This lock seam presented a difficult fabricating problem until Carpenter Stainless Strip went on the job. For planning your new or redesigned products, be sure to specify Carpenter uniform, soft and ductile Stainless Strip.

The Carpenter Steel Company • 109 W. Bern Street • Reading, Pa.

Carpenter STAINLESS STEELS

BRANCHES AT
Chicago, Cincinnati, Cleveland, Detroit, Hartford, Indianapolis, New York, Philadelphia, St. Louis

PRECISE GRINDING
of 155-mm Howitzer Barrels . . .

..in NORTON GRINDER
(20" × 168" TYPE D)

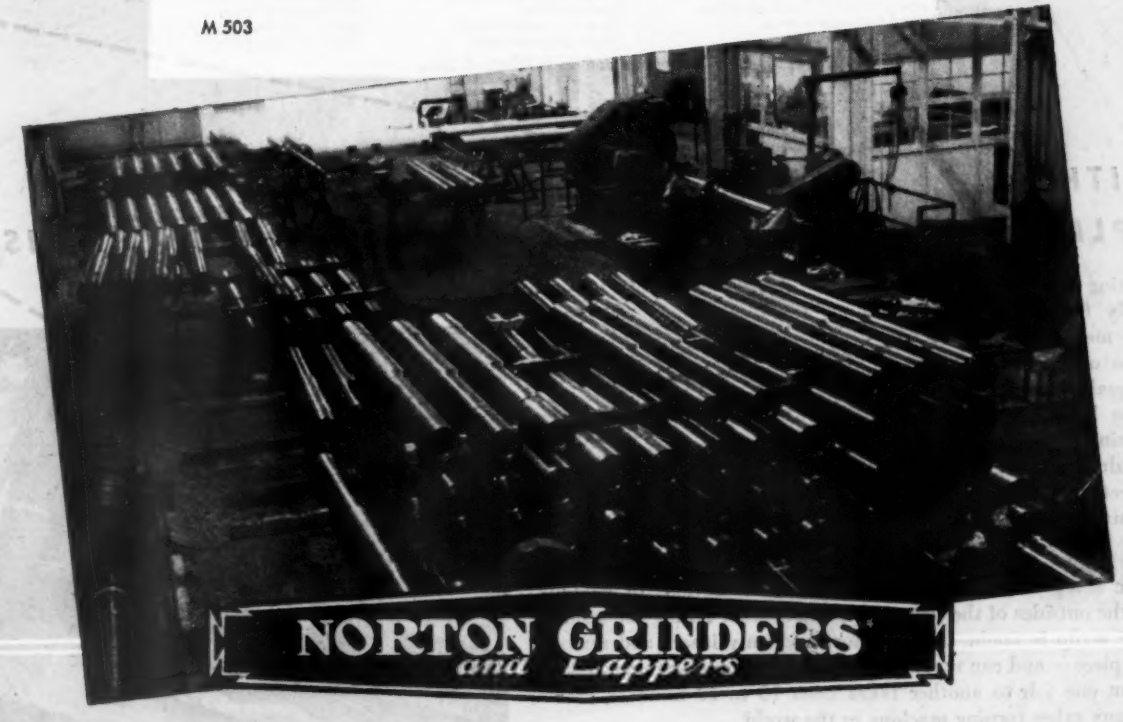
THIS 20" Type D Norton Grinding Machine at the Yuba Manufacturing Company, Benicia, California is one of many used in arsenals and gun shops for externally finishing howitzer and other heavy artillery tubes to within extremely close limits.

In addition to armament work these Norton Grinders are used for the precision finishing of long shafts, rolls and parts for heavy machinery.

Standard sizes of the Norton Type D Grinder range from 20 to 36" swing and 96" to 192", or longer, between centers. The many distinctive features of these large Norton Grinders are illustrated and described in Catalog No. 1062. Write for a copy today — no obligation.

NORTON COMPANY, WORCESTER 6, MASS.

M 503



Eighteen operations

Contour turning and boring this cream separator stem cover, and the stem itself, take only two operations for each piece, on the Monarch Magnamatic. Previous methods required 20 operations per piece.

In use, the stem and cover assembly rotates at 7000 rpm, so balance must be perfect to prevent wrecking the mechanism. Extreme thinness of walls (maximum $\frac{1}{8}''$) calls for delicate precision. Complete interchangeability of millions of pieces demands exact uniformity. All these are met with the Monarch Magnamatic.

This job illustrates how, with modern tools, mass production methods can be applied to the most difficult jobs, to reduce prices and thus enlarge markets. Our engineers will gladly work with you to help you cut your costs and improve your production with Monarch turning machines.

THE MONARCH MACHINE TOOL COMPANY • SIDNEY, OHIO

DIRECT FACTORY BRANCHES

CHICAGO 6, ILLINOIS
622 W. Washington Blvd.
Phone: Randolph 4295

CLEVELAND 6, OHIO
Room 209 Upper Carnegie Bldg.
10465 Carnegie Avenue
Phone: Garfield 2590

DETROIT 2, MICHIGAN
801 Fisher Building
Phone: Trinity 1-0426

INDIANAPOLIS, INDIANA
Maco Building
38 and College Avenue
Phone: Wabash 2650

NEWARK 2, NEW JERSEY
635 Industrial Office Bldg.
Phone: Mitchell 2-1770

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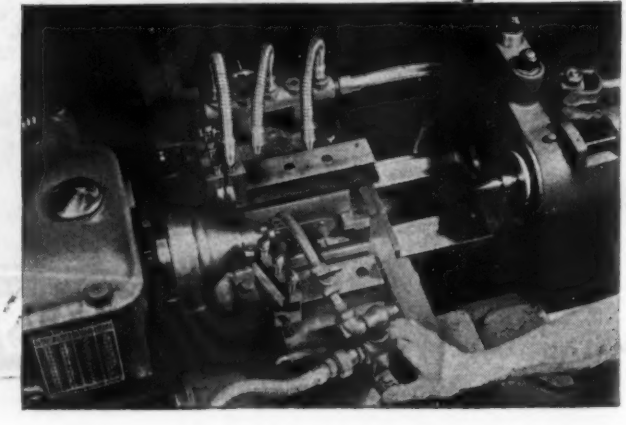
Representatives in Principal Cities

...WITH A SIMPLE TEMPLATE

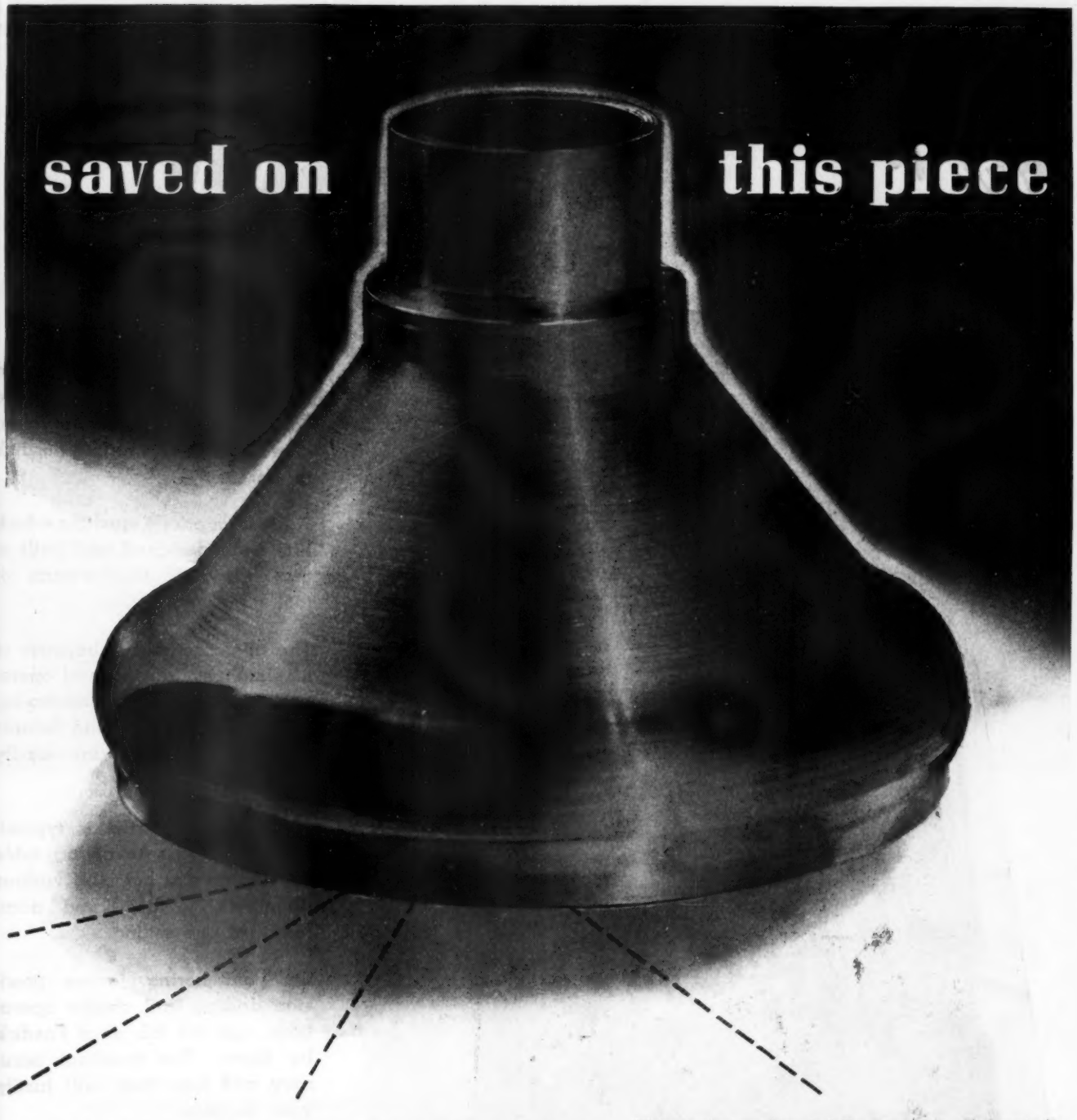
The cutting tool automatically and accurately follows the contour of the thin metal template, to produce two or two million parts with equal accuracy. Template can be stored and used again at any time, and resulting parts will be perfect duplicates of the original run.

...AND SETUP LIKE THIS

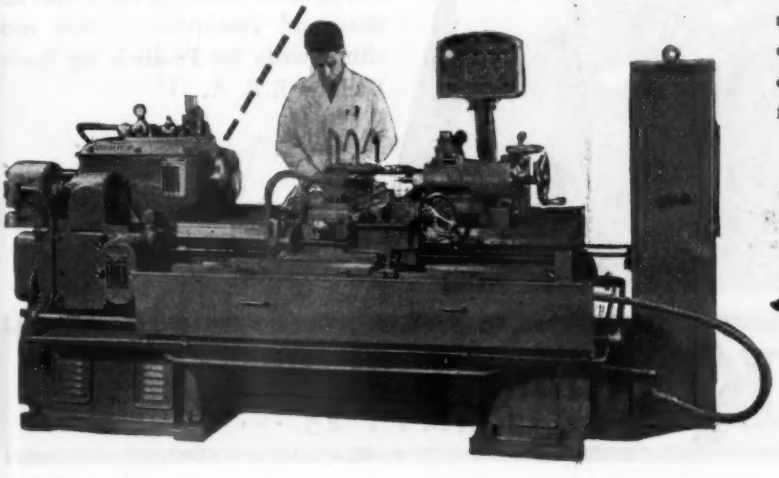


Only one setup is required for each of the operations of contour turning the outsides of the two pieces, and contour boring the insides. Once the setup is made, the operator need only insert and remove the workpiece—and can readily attend two or more machines. Setup time from one job to another takes from 10 to 30 minutes, faster than on any other turning machine in the world.

saved on this piece



...ON A MONARCH MAGNAMATIC!



This turning machine is fully automatic, all electrically controlled. Six different feed rates can be automatically selected, depending upon depth of cut and finish required. One button on control panel starts the complete operating cycle. An endless variety of turning, boring and facing work can be done on this improved Magnamatic.

Monarch Saves Time

The Toolmaker's Friend

FOSDICK JIG BORER

● In hundreds of Tool and Die Shops where toolmakers are called upon to meet exceptional tolerances—you will find Fosdick Jig Borers.

A medium priced machine which has been designed and built to meet the rigid requirements of tool room production.

The operator likes it because of its simplicity and ease of operation and its ability to perform accurate work on jigs and fixtures and miscellaneous parts—easily—quickly.

The work illustrated is typical. The use of the revolving table permits several holes, of various diameters, to be bored accurately at one setting.

On your boring, facing, precision drilling and similar operations—put the job on a Fosdick Jig Borer. The resultant accuracy and low costs will justify your decision.

For specific data on the construction and operation of this machine write for Fosdick Jig Borer Bulletin J. B. A.

ARMY E NAVY

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

HARDINGE High Speed Precision Lathes give extreme accuracy, high spindle speeds and ease of operation

Designed to meet requirements of extreme lasting accuracy, high spindle speeds and the ease in operation required for the smaller diameter work range found in every tool room, laboratory and production department.

The simplicity of operation enables relatively unskilled operators to produce parts to the necessary close limits without expensive tooling. Your larger, expensive equipment will not meet all of the foregoing requirements necessary for practical results and proper economy.

Because of the many advantages found through actual use, Hardinge Precision Lathes are being installed in ever-increasing numbers.

SPECIFICATIONS

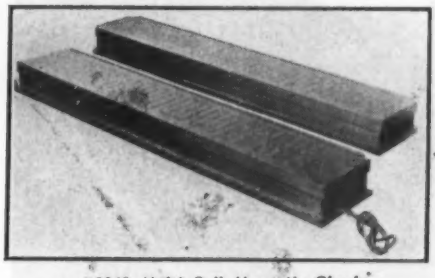
1" collet capacity, 9" swing, 17" center distance, eight spindle speeds up to 4000 r.p.m.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

WALKER MAGNETIC CHUCKS GRINDING MACHINES

The WALKER LINE

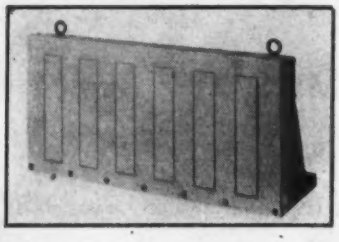
Included in the complete Walker Line are Electro Magnetic and Permanent Magnetic Chucks for use on grinders, lathes, shapers, planers, drilling machines, etc. for both tool room and production service. A complete range of sizes is offered in Rectangular, Swivelling, Vertical Face and Rotary types. Illustrated literature is available giving specific information. The chucks shown here are typical in the Walker line.



#1062 Multi Coil Magnetic Chucks

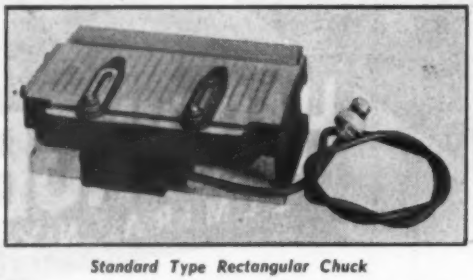
While in most cases standard chucks are entirely suitable, Walker design is such that a wide range of face plate construction is readily available.

Rotary Magnetic Chucks in standard diameters 6¼" to 36½". Standard, "Interlocking" and "Concentric Gap" Types available.



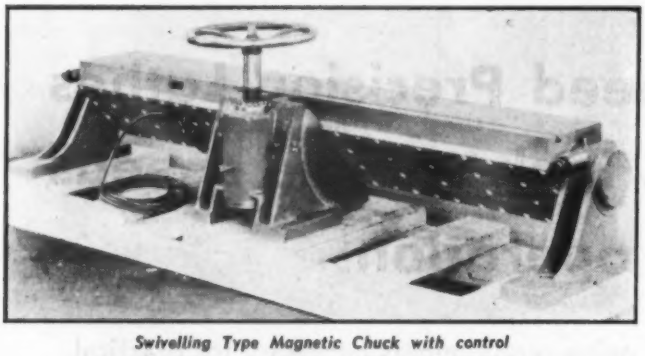
Walker Vertical Face Magnetic Chucks are made in a full range of working face sizes, are exceptionally strong and are adapted to a wide variety of work.

Coils in Walker Magnetic Chucks are highest quality enameled wire of proper size to prevent undue heating.



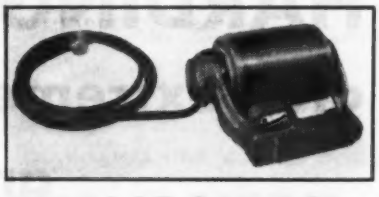
Standard Type Rectangular Chuck

The new Walker All Purpose Magnetic-Electric Longitudinal Pole Chuck, designed for hard usage and absolutely waterproof, are available in several sizes for early shipment.



Swivelling Type Magnetic Chuck with control

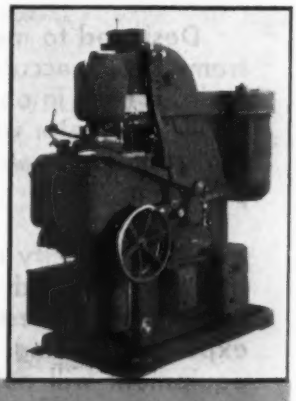
Walker Demagnetizers are available in standard D.C. and A.C. Types for either 110 or 220 volt operation. The portable unit shown is suitable for the removal of residual magnetism from a wide variety of work.



THE WALKER SURFACE GRINDER

High production, extreme accuracy and big savings are assured by the Walker D.B. Surface Grinder. This modern, convenient machine has a capacity for handling parts having hubs up to 6" diameter. Lowering or raising wheel head automatically starts or stops table and magnetizes the magnetic chuck.

Send for Bulletin.



Swivelling Type Permanent Magnetic Chuck

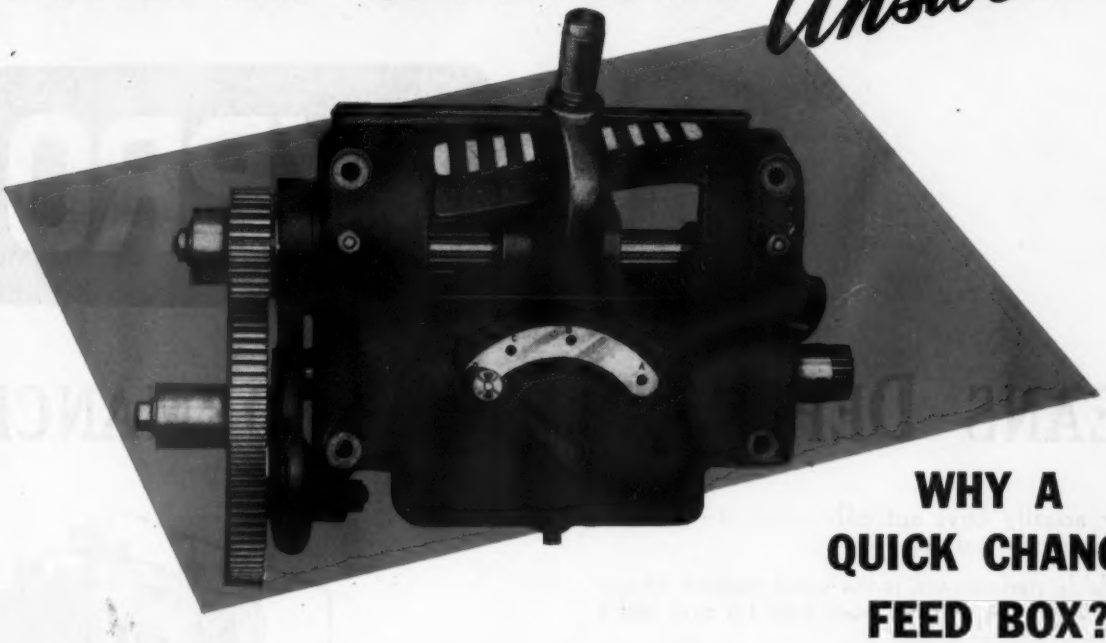
A new line of Permanent Magnetic Chucks is now available from Walker. These chucks have 35% more holding power, greater effective magnetic area and retain holding power indefinitely. Swivel types are made in the following sizes: 4" x 8", 5" x 18", 8" x 24".

O. S. WALKER COMPANY, INC.

WORCESTER, MASS.

Makers of Rectangular, Swivel and Rotary Magnetic Chucks

TURNING QUESTIONS *Answered!*



WHY A QUICK CHANGE FEED BOX?

Because it greatly speeds and simplifies the selection of feeds and thread cutting ratios. When coupled to the splined feed rod, 54 to 63 definite feeds can be transmitted to the longitudinal movement of the carriage, or the cross movement of the tool slide. When coupled to the lead screw, the same number of definite threads can be cut. Two hand-operated handles control the multiplicity of its combinations. This precision made Quick Change Feed Box is another of the many LeBlond features . . . another reason why men of machine tool "know-how" specify LeBlond Lathes.

★

SINCE 1887

the world has been turning to LeBlond for turning equipment.

★

WRITE FOR CATALOG!

AT YOUR SERVICE

LeBlond field engineers are prepared to help you in your development work, particularly along the lines of the difficult, the "out-of-the-ordinary" turning problems. The accumulated knowledge of every manufacturing trend in good times and bad—peace and war—gained over a period of nearly 60 years from thousands of installations all over the world is yours for the asking. Contact our nearest dealer or write Department FE46.

THE R. K. **LeBLOND**

★ YOUR BONDS BUY BOMBS ★
BUY A "BLOCK-BUSTER" TODAY!

MACHINE TOOL CO., CINCINNATI 8, OHIO, U. S. A.

NEW YORK 6, Singer Bldg., 149 Broadway, WOrth 2-0722
CHICAGO 6, 20 North Wacker Drive, STA 5561

LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES

CINCINNATI

HYPRO

MEANS DEPENDABLE PERFORMANCE

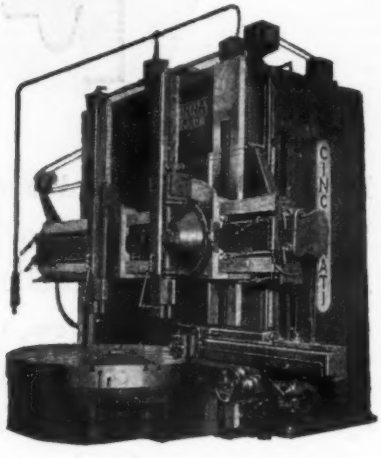
Industry actually buys not only products—but how well these products do the job.

Dependable performance is the exact promise of any Hypro—a promise that has been kept for over half a century.

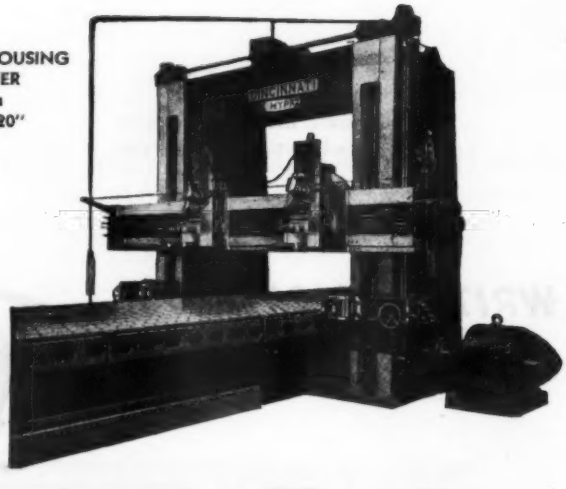
Leaders in practically all industrial fields almost without exception use Hypro machines in the products they make. Low cost operation, faster production, lower maintenance are basic integral parts of all Hypro machines.

That is why engineers, not only in America but all over the world, recognize the advantages inherent in Hypro Machines.

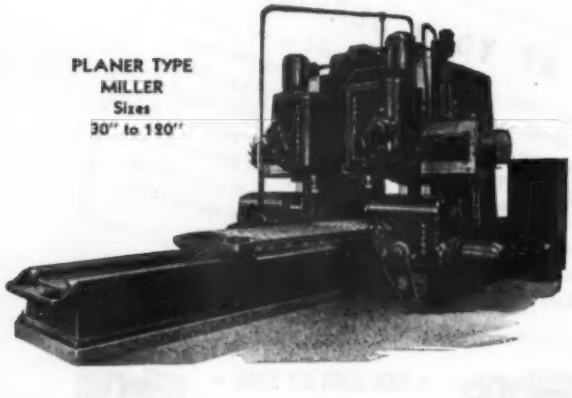
Let us help you solve your peacetime problems. For a complete line of Hypro Machines write for catalog No.



VERTICAL BORING MILL
Sizes
8' to 12'



DOUBLE HOUSING PLANER
Sizes
24"—120"



PLANER TYPE MILLER
Sizes
30" to 120"

THE CINCINNATI HYPRO PLANER COMPANY

PLANERS · BORING MILLS · PLANER TYPE MILLERS

CINCINNATI, OHIO

SHELLS today . . . but what about Tomorrow?

● The full impact of these 105 mm. H. E. shells is being felt by America's enemies in terms of explosive terror—with thousands of them finding their mark.

The full impact of new methods in producing them will be felt by American manufacturers in terms of faster machining speeds, greater accuracy, increased efficiency. The lessons learned in war production will mean lower costs, for many products, than have ever been known before.

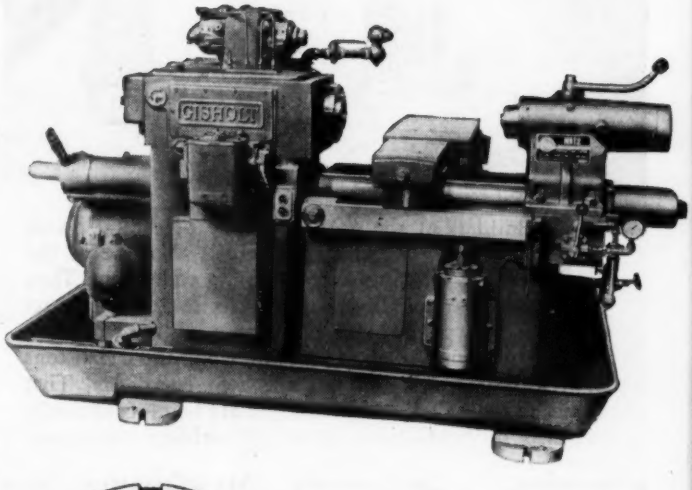
GISHOLT HYDRAULIC AUTOMATIC LATHES

The ability to handle a wide variety of work, with easy tool set-up and independent feeds for both front and rear tool slides, makes the Gisholt Hydraulic Automatic Lathe practical for taking over many jobs previously handled on other types of machines.

For automatic machining—on either between-centers or chucking work—the Gisholt Hydraulic Automatic Lathe combines the speed and accuracy that cuts cost to the bone. Write for literature.

GISHOLT MACHINE COMPANY
1201 East Washington Avenue • Madison 3, Wisconsin

Look Ahead . . . Keep Ahead . . . With Gisholt Improvements in Metal Turning



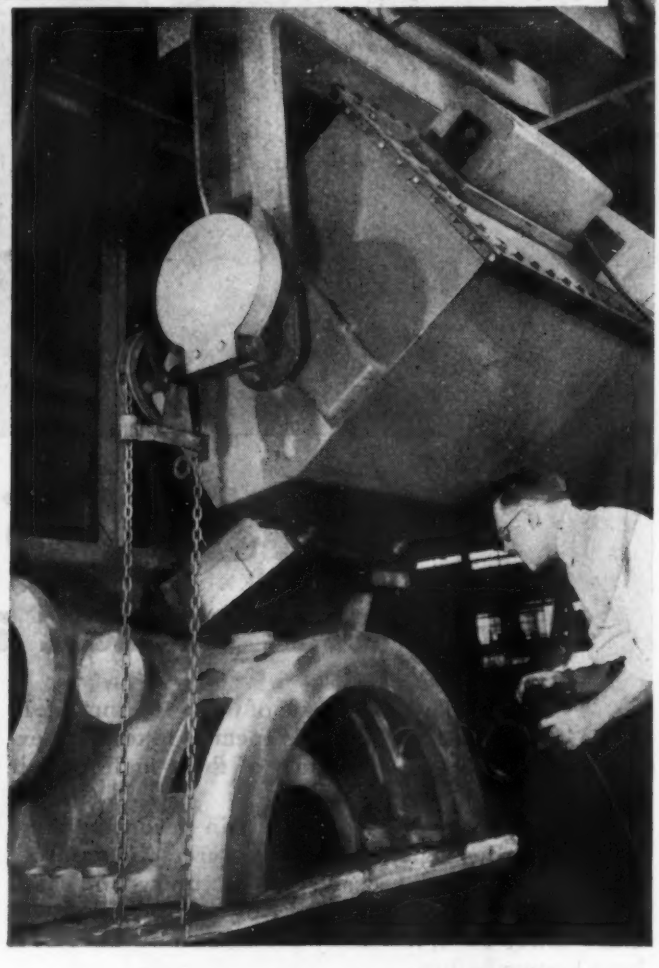
The Gisholt No. 12 Hydraulic Automatic Lathe, tooled as shown in upper photo, cuts off shell boss, faces base to length and forms band groove. Total floor-to-floor time is 1 minute.

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

ALLIS-CHALMERS ELECTRODES HAVE GOT TO BE GOOD!

BECAUSE: 1) We use them *ourselves* — tons of them a day... 2) We constantly check weld metal by X-Ray, tensile machine, metallographic microscope, etc. — to be *sure* A-C electrodes are coming through right.



1 Builders of the greatest variety of capital goods in the world, Allis-Chalmers is also one of the world's largest *users* of welding equipment. Thus we ourselves use Allis-Chalmers electrodes for practically *every* type and size of welding job known to industry. In one A-C shop alone over one and a half tons of arc welding electrodes are used every day. That means Allis-Chalmers electrodes are being continually tested *in production*—under *all* welding conditions.

2 Soundness of weld is determined by modern research equipment such as the above giant 400,000 v X-Ray machine—being maneuvered into position to "shoot" part of a high pressure turbine. This positive, non-destructive method of weld examination provides a *direct* check on electrode performance. Yes, Allis-Chalmers electrodes have *got* to be good! You can get them at our nearby district office or welder dealer. Send for bulletin B6340. A 1808

ALLIS-CHALMERS, MILWAUKEE 1, WIS.

A-C Electrodes
EASY TO REMEMBER
EASY TO BUY
Sold by AWS Number

HEADQUARTERS FOR WELDING EQUIPMENT

AMPAC A-C WELDERS

WELD-O-TRON D-C WELDERS

ARC WELDING ACCESSORIES

GOOD THINGS AHEAD

It is reported that . . . . . .

One of the obstacles in the way of large-size home television is the cost of the necessary aspherical lenses. A new material and method makes it now possible to mold these accurately of plastic at much lower cost. *Polaroid Corp.*

get ready with CONE for tomorrow

A "plastic foam" has been developed that is semi-rigid and weighs only about one-seventh as much as cork.—*U. S. Rubber Co.*

get ready with CONE for tomorrow

A western college is preparing courses in the management of small business, particularly for returned veterans. *Western Reserve University.*

get ready with CONE for tomorrow

Before the war we imported about one million glass eyes from Germany. Now an American manufacturer is reported to be filling a Russian order for 50,000 plastic eyes and to promise them for the use of our civilians later in the year. *American Optical Co.*

get ready with CONE for tomorrow

Three coal companies and six railroads are to collaborate in a million dollar research program to improve the coal burning locomotive. *Bituminous Coal Research, Inc.*

get ready with CONE for tomorrow

An automobile manufacturer is expected to enter the farm market with a number of new tools including a modified flame thrower for killing weeds. *Graham-Paige Corp.*

get ready with CONE for tomorrow

A new electronic piston ring inspection instrument uses beams of light to check accuracy within 0.001 inches in less than five seconds. *Sheffield Corp., Dayton.*

get ready with CONE for tomorrow

A new process claims to be able to electroplate aluminum with any of the conventional plating metals. *Alumon Euthone Co., New Haven.*

A new glass resists heat up to 1650 degrees Fahrenheit. *Vycor—Corning Glass Works.*

get ready with CONE for tomorrow

A new Diesel engine burns natural gas, coke-oven gas or sewage gas, as well as oil, without shutting down to exchange parts. *Cooper-Bessemer Corp.*

get ready with CONE for tomorrow

A new anodizing process makes magnesium resistant to corrosion. *Consolidated Vultee.*

get ready with CONE for tomorrow

The craft of gem cutting is being taught in this country to returned veterans in an effort to hold the advantage in this field that the war has given us. *Gabriel Williams, N. Y.*

A 96-pound bearing produced by powder metallurgy is claimed to be the largest of its type yet made. *Chrysler Corp., Amplex Div.*

get ready with CONE for tomorrow

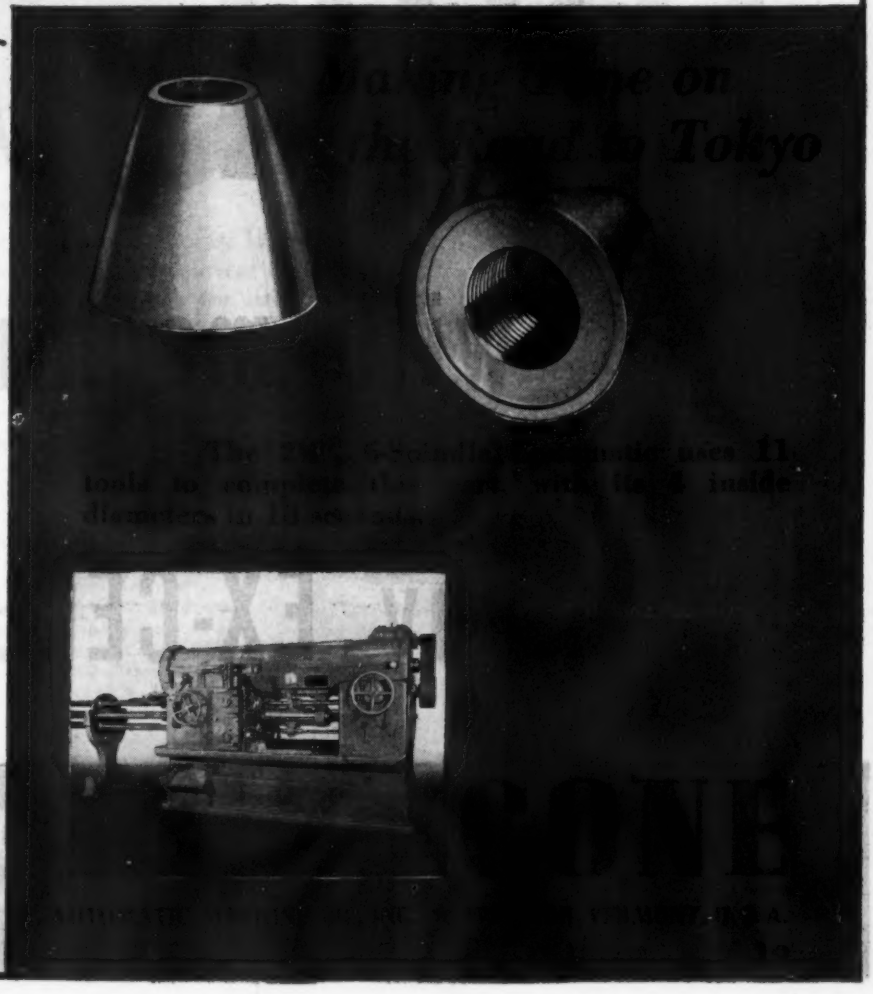
The first direct drive steam turbine locomotive to be built in the United States is undergoing tests to determine its adaptability to long-distance high-speed freight and passenger service. It is said to be capable of pulling a passenger train at 100 miles per hour. *Penn. RR Baldwin Locomotive Works—Westinghouse.*

get ready with CONE for tomorrow

A photographic technique is claimed to be so sensitive that it will record even differences in air pressure such as shock and sound waves or air jets. *Schlieren Method—General Electric.*

get ready with CONE for tomorrow

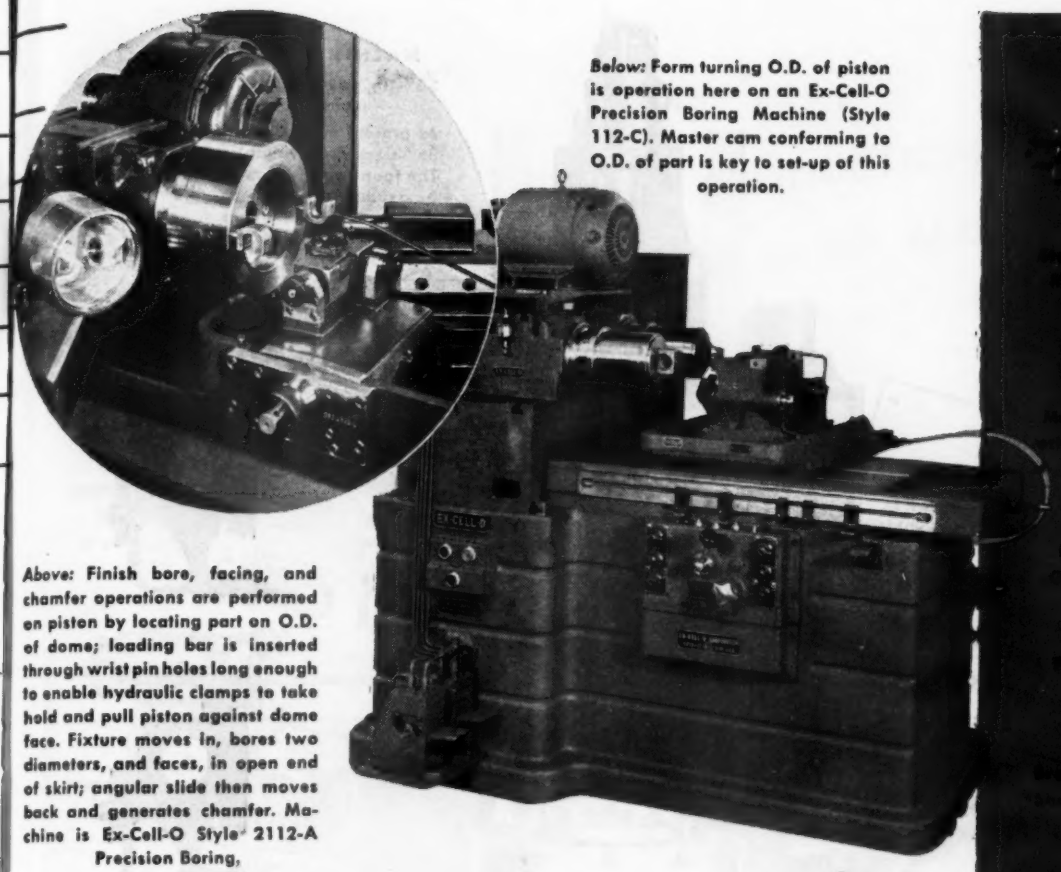
A new dynamometer can stop a 158 ton wheel, whirling 3 miles per minute in 18 seconds. *Westinghouse.*



For quick future Action:
1. Lower Unit Cost (Multi-Operation Machines)*
2. Rebuilding Active Sales Force
(a) District reorganization
(b) Sales Training?
3. New Advertising and Sales Promotion
4. Distribution and N

HIGH on your

*with machines
designed for the job
by EX-CELL-O



Below: Form turning O.D. of piston is operation here on an Ex-Cell-O Precision Boring Machine (Style 112-C). Master cam conforming to O.D. of part is key to set-up of this operation.

Above: Finish bore, facing, and chamfer operations are performed on piston by locating part on O.D. of dome; loading bar is inserted through wrist pin holes long enough to enable hydraulic clamps to take hold and pull piston against dome face. Fixture moves in, bores two diameters, and faces, in open end of skirt; angular slide then moves back and generates chamfer. Machine is Ex-Cell-O Style 2112-A Precision Boring.

reconversion list

Already is indicated the nature of things to come, as far as tomorrow's production costs are concerned. One main source for lower costs will be machine tools that offer more efficient methods for production, through progressive stations and multiple operations. In developing standard and special machine tools that perform a variety of close-limit operations, Ex-Cell-O has had unique experience that eminently qualifies it to meet the production problems facing the major industries of this country. Write to Ex-Cell-O Corporation, Detroit 6, Michigan, today.

Where increased production, high accuracy, and greater economy through multiple operations are required . . . See Ex-Cell-O First!

Right: If you do not now receive Ex-Cell-O TOOL TIPS, devoted to precision and speed in production, send your name, company, address and position to Ex-Cell-O Corporation, 1200 Oakman Boulevard, Detroit 6, Michigan.

MACHINE SIZES
30"-36"-42"-54"-64" and 74"
At present only 30" and 36" sizes are available. The four larger sizes will be available as soon as manufacturing conditions permit.
BULLARD
MAN-AU-TROL V.T.L.
combines
unlimited flexibility with the production speed of special purpose machines
BULLARD
MAN-AU-TROL V.T.L.
BULLARD
MAN-AU-TROL
MASTER OF THE MACHINE

. . . *thanks to* MAN-AU-TROL

the automatic control that is as versatile as manual control

This new Bullard MAN-AU-TROL V.T.L. differs from ordinary automatic machines because it is *first* a manually-operated machine. It is not committed to any definite sequence of functions until the operator runs one piece through completely . . . manually bringing the tools through each cut . . . making a simple MAN-AU-TROL automatic setting at the end of each cut.

When all operations have been completed and all function stops set, the operator moves a single lever and MAN-AU-TROL's automatic cycle takes over . . . doing the work faster and more accurately than manual operation . . . while the operator supervises, loads and unloads. When required, he can revert to manual operation without affecting the automatic set-up.

Set-up time from one job to any other of the endless variety of jobs within the scope of a MAN-AU-TROL V.T.L. is little more than for an ordinary manually-operated machine.

For further reasons why the new Bullard MAN-AU-TROL V.T.L. increases shop efficiency and lowers production costs, write for booklet A.

The Bullard Company, Bridgeport 2, Connecticut.

BULLARD CREATES *NEW METHODS* TO MAKE MACHINES DO MORE

"WITH GULF CUT-AID WE INCREASED PRODUCTION AND ELIMINATED DRAG MARKS"

says this grinding dept. Foreman

Grinding department Foreman of aircraft engine plant (center) consulting with Gulf Service Engineer on results obtained with Gulf Cut-Aid in grinding aluminum alloy piston skirts.

"WHEN WE USED SOLUBLE OIL the wheel loaded after grinding a few piston skirts, which resulted in drag marks and a poor finish," says this grinding department Foreman. "Since switching to Gulf Cut-Aid we have ground over 2,000 skirts without a drag mark—and consistently get a No. 10 mirror finish."

Well known for its superior performance in cutting aluminum, aluminum alloys, and other nonferrous metals, Gulf Cut-Aid is being used in more and more plants as a grinding fluid.

Call in a Gulf Service Engineer today and let him show you how Gulf Cut-Aid and other Gulf quality oils can help you with your production problems. For your copy of the booklet on Gulf Cutting Oils, send the coupon below.

GULF INDUSTRIAL LUBRICATION

Gulf Quality Cutting Oils

Gulf Lasuper Cutting Oils A, B, and C
Gulf Electro Cutting Oils A, B, and C
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Gulf Cut-Aid
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Please send me, without obligation, a copy of the new revised booklet, "Gulf Cutting Oils," which includes a helpful Machining Guide.

Name.....

Company.....

Title.....

Address.....

GENERAL MACHINERY CORPORATION

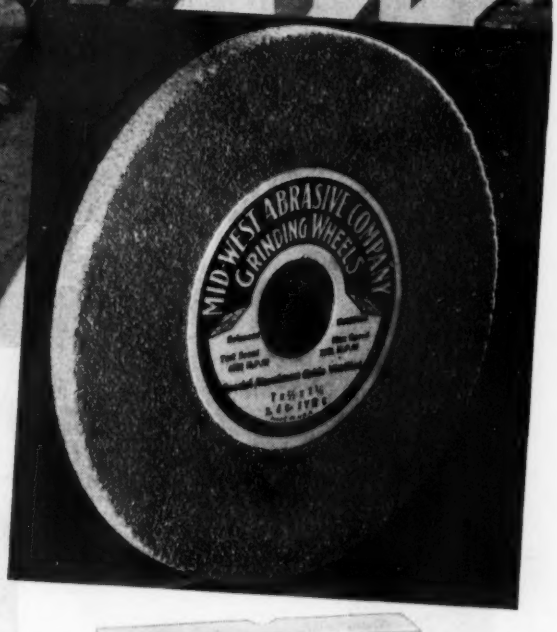
PRODUCERS OF HAMILTON STEAM AND DIESEL ENGINES, CANNON AND MACHINE TOOLS

GENERAL MACHINERY CORPORATION

HAMILTON, OHIO

THE NILES TOOL WORKS CO. • THE HOOVEN, OWENS, RENTSCHLER CO. • GENERAL MACHINERY ORDNANCE CORPORATION

SETTING THE PACE!



● **The lead trotter pounds around the curve, setting the pace for others to follow. That's how Mid-West Abrasive Company products set the pace in the abrasive field.**

Quality engineering for each item in the broad Mid-West line has brought about this leadership. It's the hallmark of every Mid-West product—grinding wheels, sharpening stones, honing stones, sandpapers, wheel dressers or abrasive specialties.

Call on our staff of experienced field engineers at any time to advise you on your abrasive problem. Prompt delivery on all Mid-West items.

MID-WEST ABRASIVE CO.

Manufacturers of DEPENDABLE Abrasives

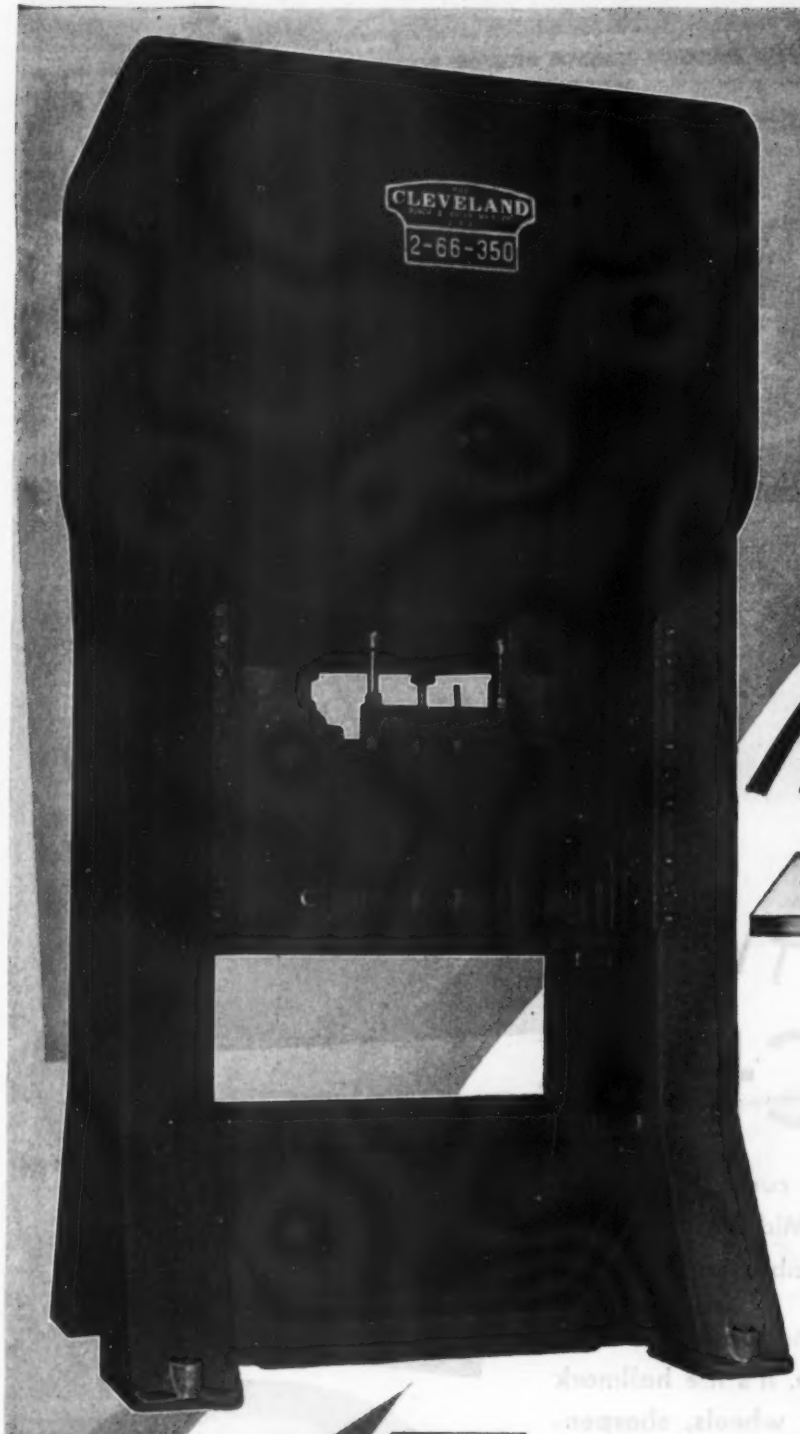
Owosso, Mich. · Detroit · Rochester, Pa.

Mid-West Abrasive Co.
1960 E. Milwaukee Ave., Detroit 11, Mich.

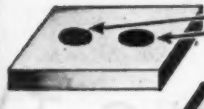
Please send complete data book on ☐ Grinding Wheels, ☐ Sandpapers, ☐ Superfinish Stones

NAME_____

ADDRESS_____



Modern



2 POINT PRESSES

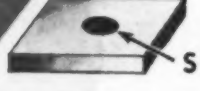
This series of rugged, streamlined Cleveland Single Point, Two Point and Four Point Presses, being modern in every respect, are designed for speed, accuracy and ease of operation in the production of pressed metal parts.

It will be noted from the accompanying illustration that all overhanging brackets and other projections have been eliminated by installing all gears, flywheel and drive unit in the box type crown, a feature which not only contributes to greater safety but also saves valuable overall floor space.

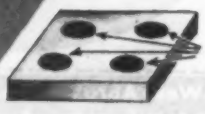
Furthermore, instead of the jaw type of Clutch, with which most mechanical presses are usually equipped, these Modern Cleveland Presses can be furnished with either a hydraulic or pneumatic friction clutch and brake, arranged with electric push button control having one or more stations.

If you are interested in Presses designed to produce metal stampings with greater accuracy and economy, write for a copy of our "Modern Press" catalog.

The Press illustrated is a Modern Cleveland Two Point which has a connection at each side of the slide. It has a capacity of 350 tons, bed area 40"x66", stroke 16", adjustment 5", and operates at the rate of 15 strokes per minute.

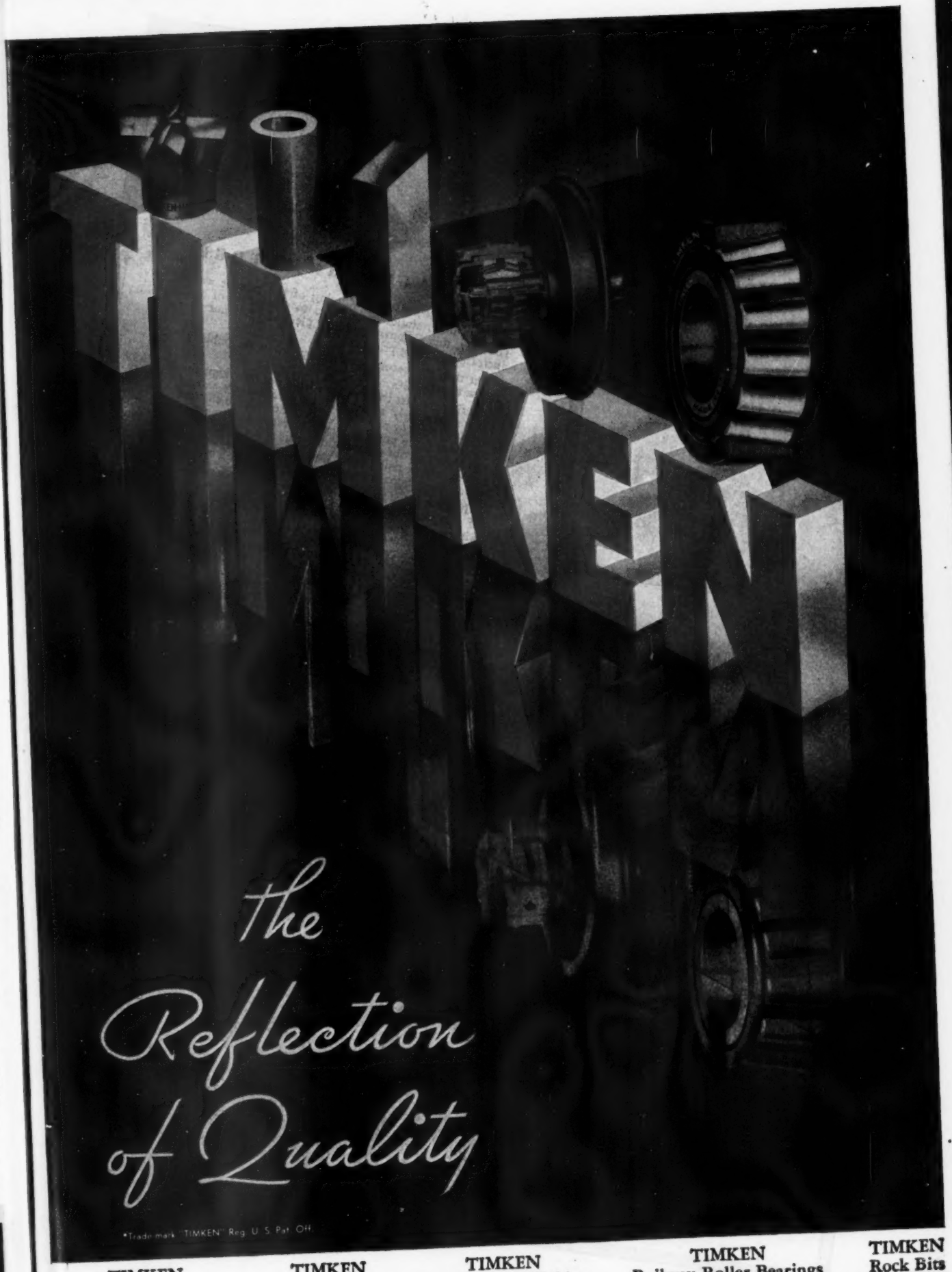


Also
SINGLE POINT
and



4 POINT PRESSES

THE CLEVELAND PUNCH AND SHEAR WORKS COMPANY
CLEVELAND, OHIO



TIMKEN Tapered Roller Bearings | TIMKEN Alloy Steels | TIMKEN Seamless Steel Tubing | TIMKEN Railway Roller Bearings | TIMKEN Rock Bits

OCTOBER 2, 1941

WE RENEW OUR PLEDGE

Two years ago, at the beginning of the present war with its uncertainties and threats to the future of all industry, this Company publicly pledged itself not to increase its selling prices.

On this, the second anniversary, we again publicly renew that pledge.

During the last two years we have not only kept the pledge previously made, but *we have actually reduced our selling prices by more than* 6% because of more efficient operation made possible by the marvelous cooperation and ability of our organization. This was accomplished in the face of rising labor and material costs, both of which have been increased by considerable amounts.

It is our belief that the only hope for the continuance of the present industrial system now threatened from within and without is in its ability to give more and more to the consumer for less and less of his dollar. This is the strength of American individual initiative. This is the hope of our country's future. If American industry can accomplish this universally, we need not fear dictators either at home or abroad.

THE LINCOLN ELECTRIC COMPANY

J. F. Lincoln
President

Cleveland, Ohio
October 2, 1941

STATEMENT OF POLICY

The world is entering a crisis, the result of which no one can foresee. Other wars have brought inflation, followed by unemployment and depression after peace was achieved. America's experience in the World War illustrates this fact.

Much of this post-war trouble would have been eliminated by a more foresighted price policy on the part of manufacturers and distributors. Price inflation by the seller when he had a dominant position resulted inevitably in reaction with deflation, depression and suffering. Many of those price increases were not warranted.

Before such an inflationary cycle of prices is again started, we publicly pledge ourselves, as far as possible, to maintain present prices.

Further, if the materials we buy are increased in price, or the cost of labor is increased, then we pledge ourselves to raise selling prices no more than the bare increase in cost of raw materials and labor going into our products.

Further, we pledge ourselves to pass on to our customers the reduction in cost made possible by better manufacturing methods, wider distribution and technical advances in production.

THE LINCOLN ELECTRIC COMPANY

J. F. Lincoln
President

Cleveland, Ohio
October 2, 1939

OCTOBER 2, 1939

★ ★ OUR PLEDGE MAINTAINED ★ ★

On October 2, 1939, we announced the policy of "no increase in selling prices". A progress report made October 2, 1941, showed we actually had reduced prices by more than 6% during the period 1939 to 1941.

We have adhered to this policy of price reduction throughout the war years. Despite general increases in the costs of labor, materials and distribution . . . and despite governmental regulations . . . we have been able to maintain or reduce our prices throughout the entire period from 1939 to date.

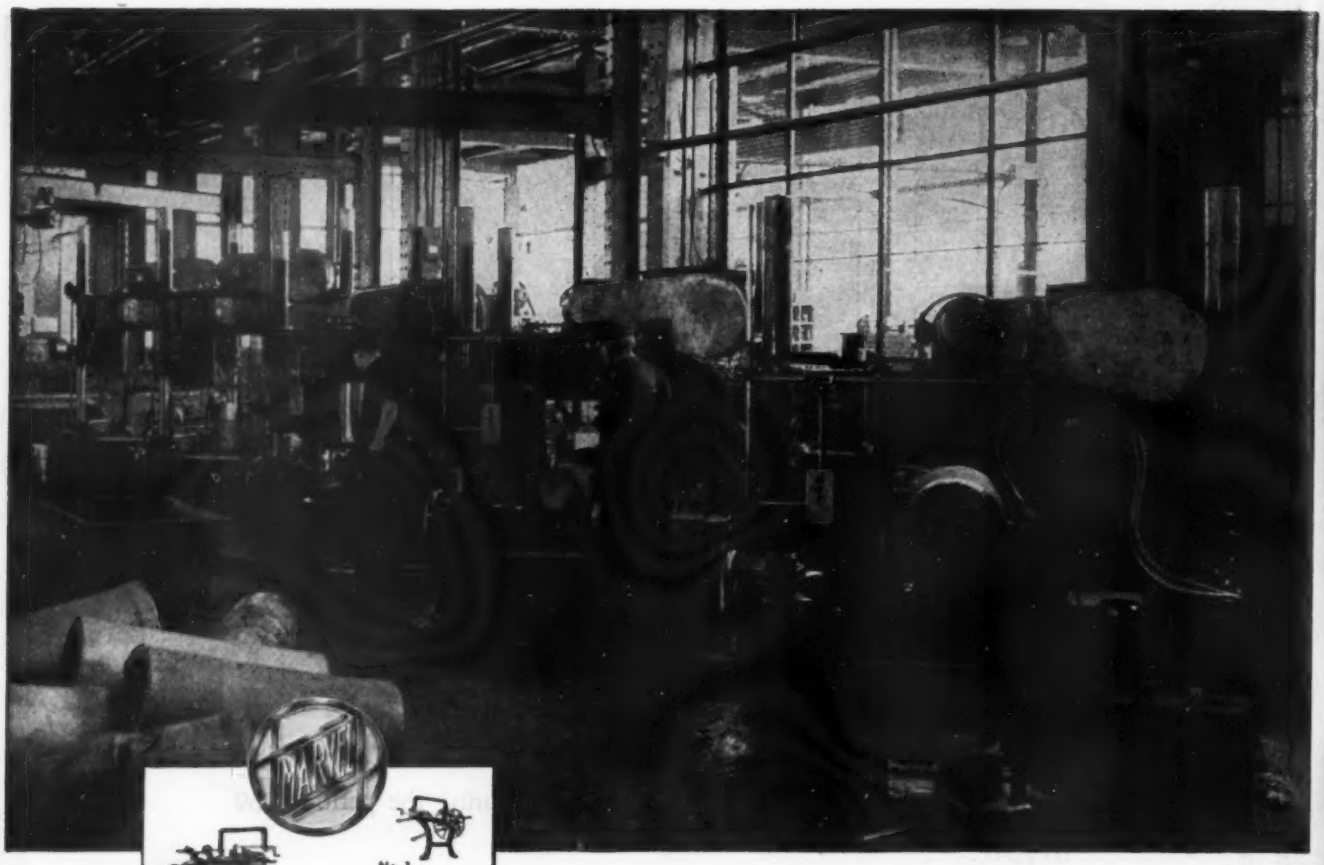
This has been made possible by our incentive system . . . a method which, if it had been applied throughout industry, would have doubled America's output of war goods for a quicker Victory and would have cut the cost of the war by 50%.

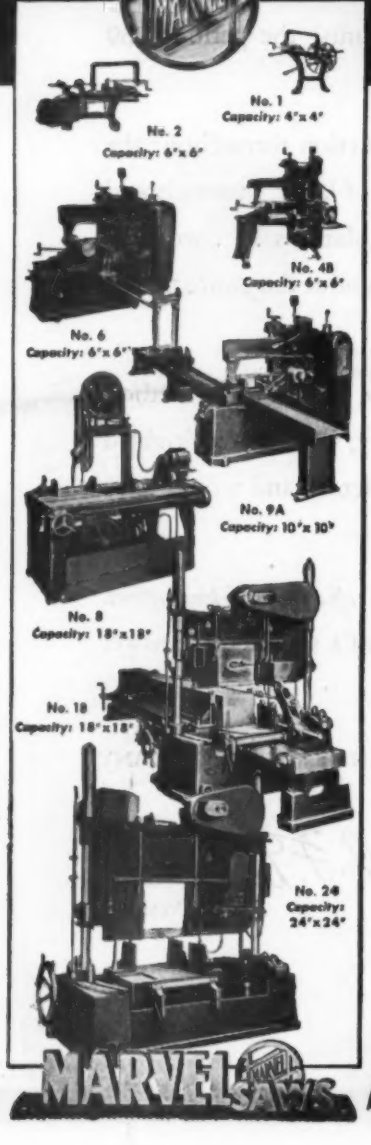
America's future depends largely upon her *efficiency of production.* Our proved incentive system has in it the seeds of a satisfactory answer to the difficulties of this nature in industry.

THE LINCOLN ELECTRIC COMPANY

Cleveland 1, Ohio
May 7, 1945
Victory in Europe

J. F. Lincoln
President





HACK SAW METHOD STEPS UP LOCOMOTIVE PRODUCTION

In the large shops of the American Locomotive Co., at Schenectady, wartime production has reached a new peak.

Among the improved methods contributing to this record output has been the increase in the use of the modern MARVEL Hack Saws for cutting-off even the largest work: for cutting-off car axles, wrist pins and all large forgings — work formerly done with more expensive methods and costlier equipment. One of the first to discover the efficiency and economy of the hack saw method for large work, this company ordered three No. 18 MARVEL Giant Hydraulic Hack Saws soon after these revolutionary Saws were first announced. Today, they are using twenty MARVEL Sawing machines, including eleven of these massive, ruggedly built, giant hydraulics.

MARVEL Saws are increasing the production of war materials in all parts of the country by rapidly, accurately and economically cutting-off the toughest steels in cross sections up to 24" x 24". If you have metal sawing problems, call on the local MARVEL Engineer to recommend methods and equipment.

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 W. BLOOMINGDALE AVE. CHICAGO 39, U.S.A.

Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

MARVEL SAWS

Tools
by UNION
are "THE TOOLS YOU
BUY AGAIN."
Union Twist Drill Co., Athol, Mass.
UNION ★ BUTTERFIELD ★ CARD Divisions of the Union Twist Drill Company

. . of course they're
BUTTERFIELDS!
BUTTERFIELD DIVISION
Derby Line, Vt.
Rock Island, Que.
UNION ★ BUTTERFIELD ★ CARD

Machine Screw

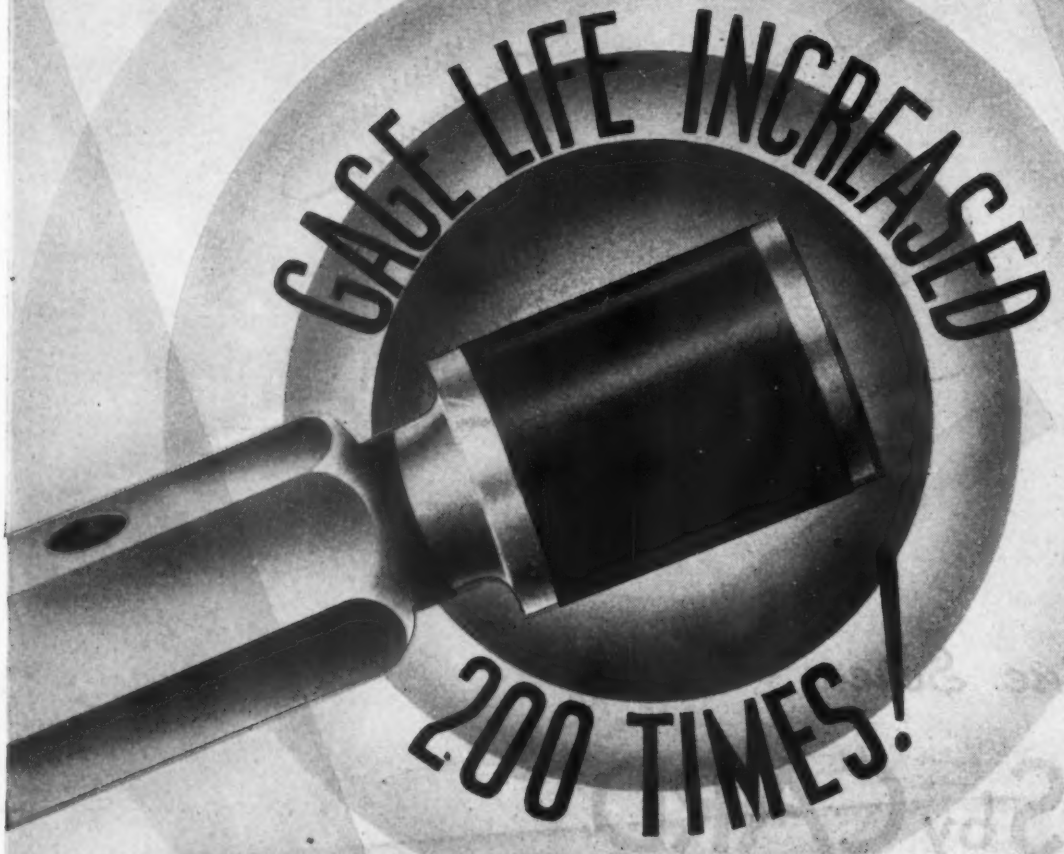
TAPS by CARD

S. W. CARD MFG. CO.

Mansfield, Mass.

Divisions of the Union Twist Drill Company

NORBIDE Gages



The fact that NORBIDE Gages will outlast conventional types of measuring devices 200 times and more is explained by the extreme hardness of Norton Boron Carbide (trade-marked NORBIDE) — the hardest material made by man. In addition to their great resistance to wear, NORBIDE Gages will not pick up lint nor become charged with particles of metal. They are lighter than aluminum. You can obtain NORBIDE Gages from your regular gage manufacturer, or for further information write to:

NORTON COMPANY
WORCESTER 6, MASSACHUSETTS

WORK GOES FASTER WITH TOOLS MADE *Lighter* WITH MAGNESIUM...

Portable tools, made lighter in weight with Mazlo Magnesium parts, are less burdensome. They're easier to work with. Workmen show less fatigue slump during the day.

Strong, durable magnesium cast parts, supplied to tool builders by American Magnesium, can stand the gaff of hard usage. Electric and air-powered grinders, tampers, chippers, drills and the like, have given excellent service all during the war. They've set a fast pace for makers of postwar tools.

Ask your tool suppliers about their products in which lightweight Mazlo Magnesium parts are employed. Aluminum Company of America, Sales Agent for American Magnesium products, 1709 Gulf Building, Pittsburgh 19, Penna.

MAGNESIUM MAZLO PRODUCTS

AMERICAN MAGNESIUM CORPORATION

SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA

Special High Carbon Steel Die Blocks ground on a Blanchard Surface Grinder.

Clutch Pressure Plate Ground on No. 11 Blanchard Surface Grinder.

BLANCHARD CYLINDER WHEEL

For VARIETY OF WORK USE BLANCHARD WHEELS ON BLANCHARD GRINDERS

It is important to select the proper wheel for every job. The three shown call for three different wheels.

The Carbon Steel Die Blocks require a wheel for stock removal. Surface finish is not important, but blocks are ground flat and parallel.

The Clutch Pressure Plate was ground using a 220C10 Blanchard Cylinder Wheel producing a finish so fine that the wheel marks disappeared, bringing out the grain in the iron.

Dies Ground on a No. 11 Blanchard Surface Grinder

"Excellent - Fast - Accurate", says the customer who is grinding dies on this #11 Blanchard. Blanchard Wheels supplied with ample coolant eliminate any danger of heating the work. Sharp cutting edges are produced.

For most efficient operation of Blanchard Surface Grinders, specify Blanchard Wheels.

The Booklet "Blanchard Wheels" contains helpful information on the selection of grinding wheels for all kinds of work—sent free on request.

BLANCHARD

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

Ground Multiple

THREAD MILLING CUTTERS

by Continental

A Shell-type cutter with margin on each end
B Modified Acme thread form cutter
C Thread cutter button for Hall Planetary machine
D Shank-type cutter
E Shank-type two-diameter cutter
F Small diameter shank-type cutter with adapter
G Shank-type cutter

for fast, accurate production

Over 20 years' experience in precision thread grinding is built into CTW ground thread milling cutters . . . CTW ground thread milling cutters maintain dimensional accuracy on long production runs throughout the entire life of the cutter . . . Available in both shank and shell type, in National, Whitworth, Acme, V and special forms of thread. Many popular sizes carried in stock . . . For high production thread milling at lower tool cost, use Continental (CTW) ground thread milling cutters. Write to Continental today.

CONTINENTAL TOOL WORKS

Division of Ex-Cell-O Corporation

DETROIT 6, MICHIGAN

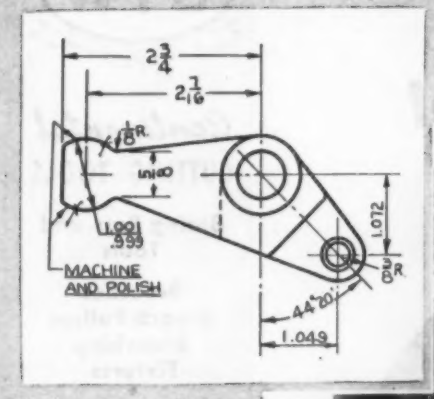
CONTINENTAL TOOL WORKS
CTW
EX-CELL-O CORPORATION

Continental
CUTTING TOOLS

- Boring Bars and Tools
- Broaches Broach Pullers Broaching Fixtures
- Core Drills
- Counterbores and Countersinks
- CTW Drive Holders
- Counterbores (Tool Room Sets)
- Counterbore Pilots
- Inserted Blade Cutters
- Carbide Tipped Cutters
- Form Relieved Cutters
- Milling Cutters
- Thread Milling Cutters
- End Mills
- Side Mills
- High Speed Steel Reamers
- Carbide Tipped Reamers
- Shell Reamers
- Inverted Spotfacers
- High Speed Steel Tool Bits
- Carbide Tipped Tool Bits
- Circular Form Tools
- Cut-off Tools
- Flat Form Tools
- Dovetail Form Tools

45-40

Can you Save 1½ Minutes on Each Shift Lever?



The case history of this shift lever job emphasizes the time-saving obtained with the Milwaukee 2D Rotary Head Milling Machine. The part used as an example here, was previously milled with a special form cutter: floor to floor time, 3¼ minutes. Read this job report:

Shift Lever Material — Malleable Iron Casting.

Operation — Mill 1" diameter

Number of Pieces — lots of 300

Initial Setup Time — 20 minutes

Rough and Finish Mill — Stock removed ⅛" on the diameter

Floor to Floor Time — 1¾ minutes

Check these advantages of the Milwaukee Rotary Head Milling Machine and how you can benefit from them in your own shop:

DIRECT . . . mills intricate shapes in a single setup without the aid of templets or models — transmitting blueprint dimensions and outlines directly to the workpiece.

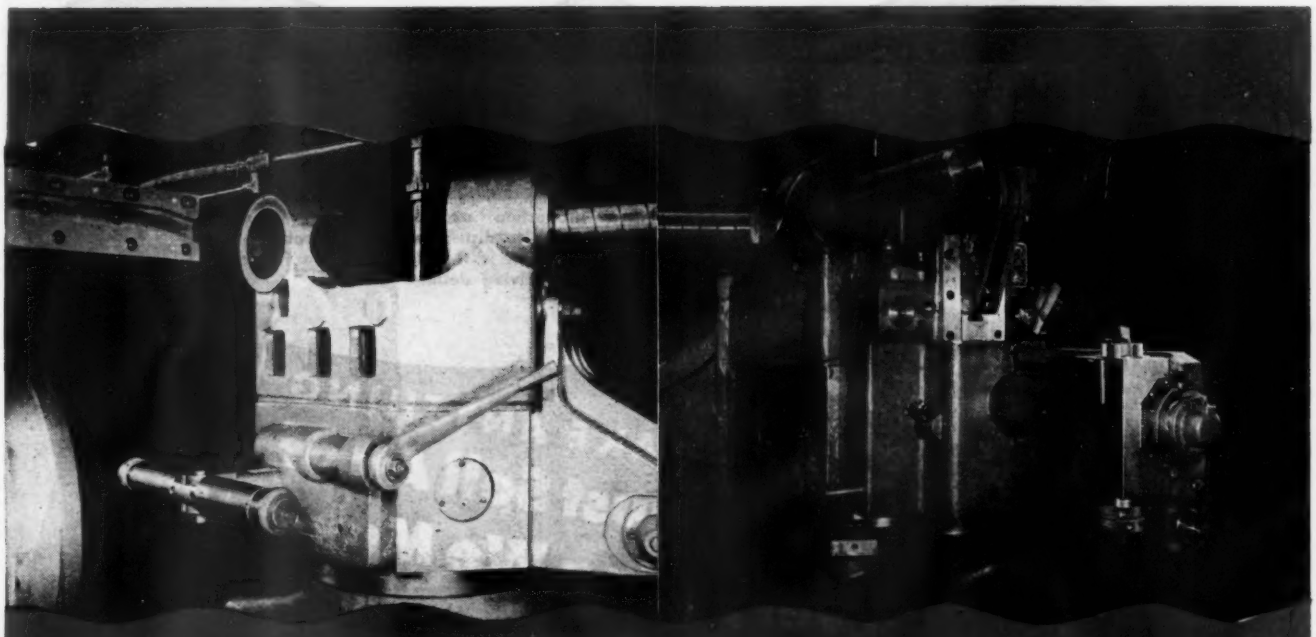
ACCURATE . . . chances for error are eliminated because there is no change in setup. Exact control of all combinations of cutting movements — possible only with this machine — transmits mathematical precision to the work.

FAST . . . initial job preparation and setup time are reduced to the minimum. Accurate performance of the machine saves operator's time and results in rapid production of work otherwise difficult to perform.

Write for Bulletin No. 1002C and complete information.

BUILDERS OF MILWAUKEE ROTARY HEAD MILLING MACHINE • MIDGETMILL • SPEEDMILL • FACE MILL GRINDER • AUTOMETRIC JIG BORER • CENTER SCOPE.

Kearney & Trecker
Products
CORPORATION
Milwaukee 14, Wisconsin
Subsidiary of Kearney & Trecker Corporation



P&J has the Re-tooling "KNOW-HOW" to convert present machines to new work....

The tooling set up of the 9 DT POTTER & JOHNSTON Chucking Machine shown here was designed by P & J engineers to handle a specific war production job. This machine (as well as all P & J machines) can be converted to handle other work. Because of wide range tooling possibilities, retooling is practical and economical.

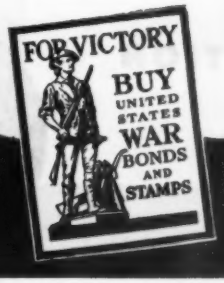
The logical course to follow in re-conversion is to call in the same engineering talent which was responsible for the original tooling and let this specialized "know-how" be applied in re-tooling for new work. After all, P & J engineers have the advantage of accumulated experience on P & J equipment.

If you are planning to use your P & J machines on post-war work, consult P & J engineers immediately and be properly prepared for reconversion.

POTTER & JOHNSTON MACHINE CO., *Pawtucket, R.I.*

P&J REBUILDING SERVICE

Investigate the rebuilding facilities available in the P & J plant for restoring your P & J equipment to original accuracy and performance. You can also re-tool conveniently at the time of rebuilding.



Fight the good fight . . . with BONDS

DISTRIBUTION
When production overbalances distribution, when we fail to distribute what we can produce, production is throttled, jobs are fewer, standards of living decline.
PRODUCTION

WE CAN MAKE ANYTHING ...We Must Sell All of Everything We Make

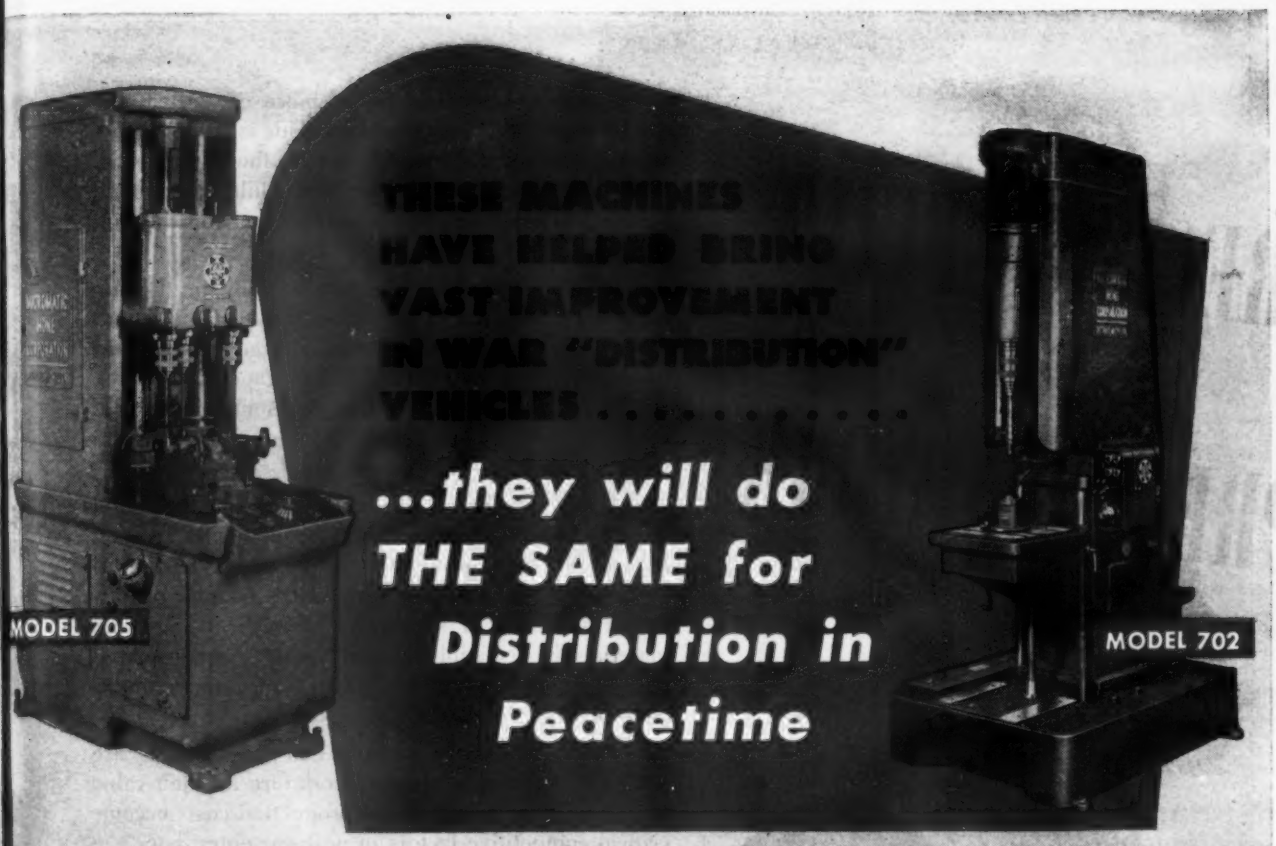
For a long time we in America have derived great comfort and assurance from the knowledge that we have the industrial ability to produce anything we may need or want. We have tied our wagon to the bright star of producing more products at higher wages to sell at lower prices.

This concept of production has brought us the largest expansion in a standard of living of any people in history.

But, while we have always been able to make anything, we have not always been able to sell all of everything we could make. We have not devoted the same enterprising energy to expanding distribution that we have to production. So, in the past, for immediate short swing relief we have resorted to government imposed restrictions on production and distribution. This expedient did not bring worth-while relief, for in the end it added up to fewer jobs, less production—higher prices.

If commerce and industry will use its inspirational ability and ingenuity to find better, cheaper methods of distribution per unit our goal of full employment may easily be accomplished and we can return to the enviable position of enjoying an expanding standard of living.

MICROMATIC HONE CORPORATION
DETROIT 4, MICHIGAN



While cost is a secondary consideration in distribution of war materials, other needs parallel peacetime distribution. Lighter, more easily operated equipment—higher pay loads—easier maintenance, and less of it—are all vital. Micromatic Honing machines have helped wartime distribution to these goals—will do the same for industry after the war. At the same time they will help lower initial and operating costs of distribution machinery—lower costs of goods delivered.

MODEL 705

VERTICAL HYDROHONER

Micromatic Model 705 Multiple Spindle Vertical Hydrohoner has built-in automatic Microsize Control which gauges work automatically—holds within tolerance of .0001" for geometric accuracy and .0003" for *uniform diameter size*—automatically stops honing cycle when correct size is reached. For internal honing or bores ¼" to 2" diameter. Rotary indexing work fixture provides high production. Usually recommended for maximum stock removal ranging from .0005" to .0015" on hardened parts—.001" to .010" on soft or medium hard. (Illustrated above, left).

Precision sphericity without measurable error is generated on ball studs by the Micromatic Ball Stud Honer.

Removes .030" stock on diameter from turned heat treated forgings.

Precision honing of long pieces—external or internal—is the work of the Micromatic Horizontal Floor Type Honer. Either hydraulic or manual control or tools. Set-ups available to generate either cross-hatch or co-directional finish patterns.

MODEL 702 Single Spindle

Type HYDROHONER

Single Spindle Type Micromatic Hydrohoner Model 702 for rapid production honing of bores or cylindrical surfaces up to 2" in diameter. (Illustrated above, right).

Silver plated bearings are production honed on a Micromatic Horizontal. Costs were reduced 50% from previous methods.

MICROMATIC HONE CORPORATION

DETROIT 4, MICHIGAN

DISTRICT OFFICES: 614 Empire Building, 206 South Main Street, Rockford, Illinois • 129 Church Street, New Haven 10, Connecticut
501 Harries Building, 137 North Main Street, Dayton, Ohio • 1031 South Broadway, Los Angeles 15, California

MAKERS OF HONING MACHINE TOOLS

PRECISION-BUILT FOR PRECISION WORK

Precision work can be no more exact than the machine on which it is produced. This is why so many war plants, known the world over for the perfection of their products, rely upon precision-built South Bend Lathes for handling operations that demand machining to close tolerances.

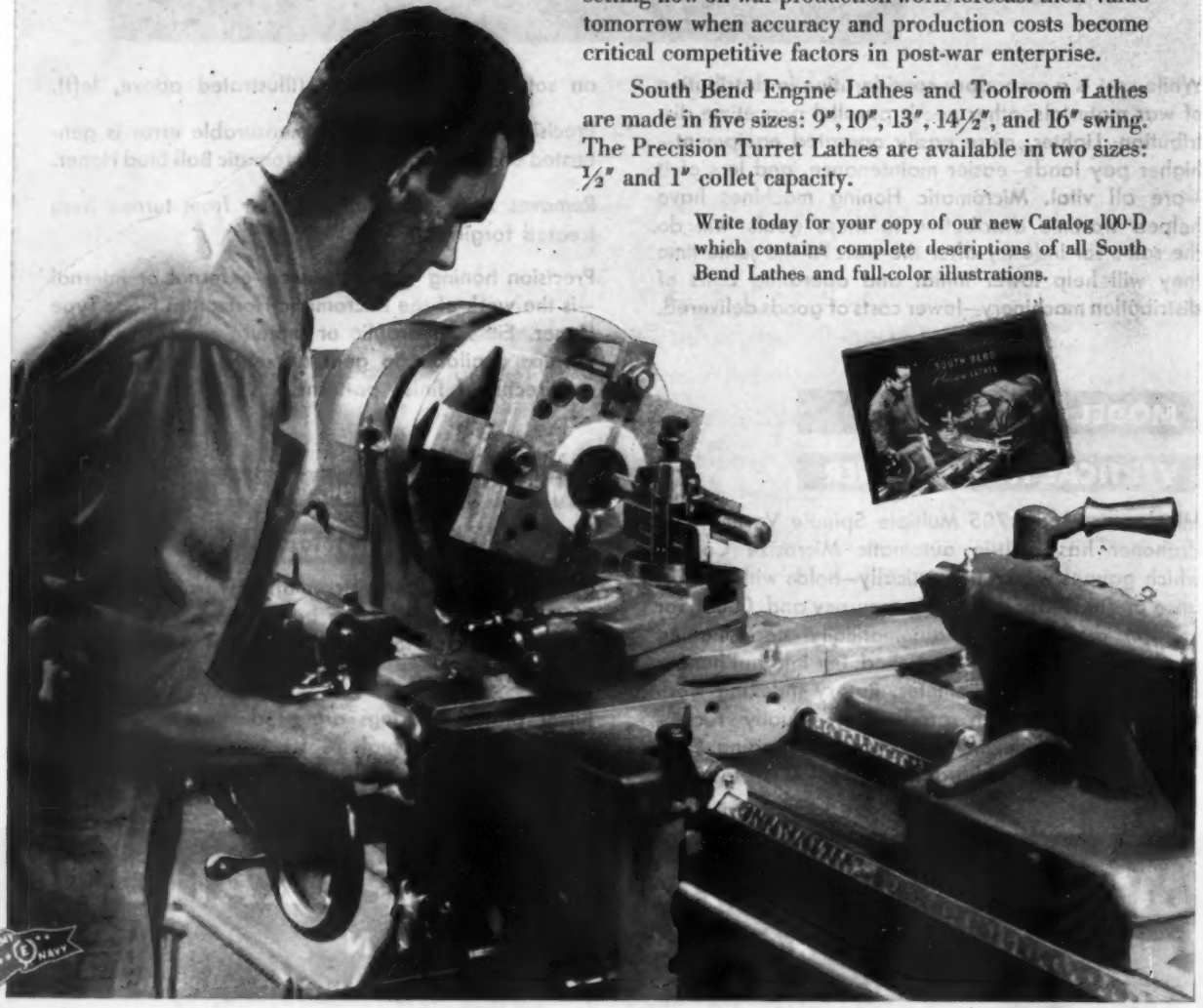
While precision is measurable only in the finished work piece, it is the direct result of the lathe's design and construction. Unusually large spindle bearings, belt drive to spindle, hand-scraped bed ways, rigidity, and smooth operation are some of the features that make South Bend Lathes capable of the most exacting precision operations.

Today, as always, our entire factory is devoted exclusively to the production of South Bend Precision Lathes. No other product is made by us. There has been no lowering of quality standards because of wartime restrictions or shortages. The use of substitute materials is negligible, limited only to non-essential parts such as name plates, paint, etc. Improvements have been accelerated.

The performance records that these lathes are setting now on war production work forecast their value tomorrow when accuracy and production costs become critical competitive factors in post-war enterprise.

South Bend Engine Lathes and Toolroom Lathes are made in five sizes: 9", 10", 13", 14½", and 16" swing. The Precision Turret Lathes are available in two sizes: ½" and 1" collet capacity.

Write today for your copy of our new Catalog 100-D which contains complete descriptions of all South Bend Lathes and full-color illustrations.



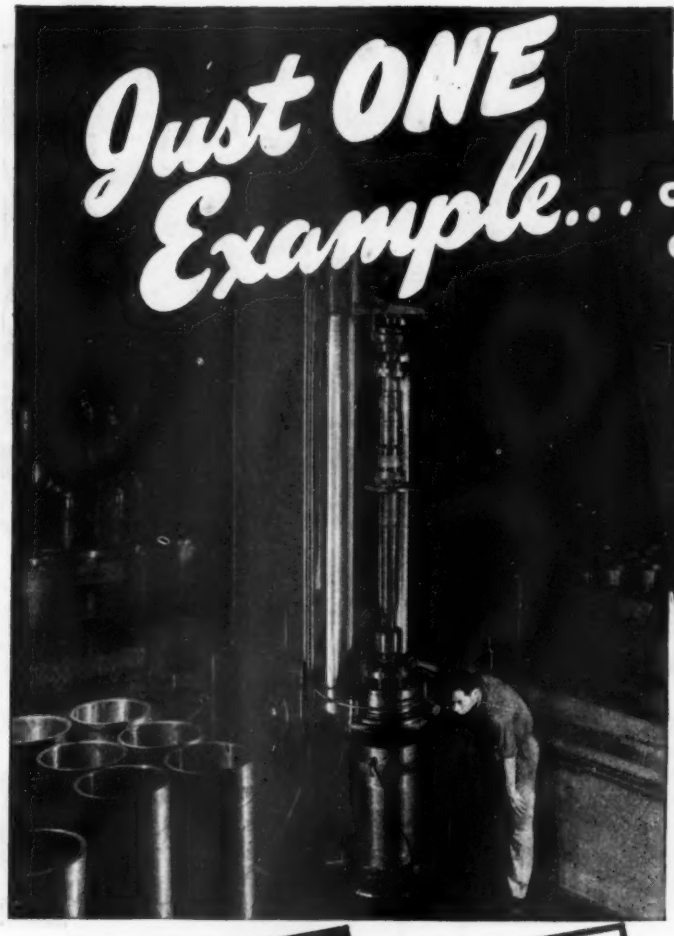
SOUTH BEND LATHE WORKS

419 E. MADISON STREET • *LATHE BUILDERS FOR 38 YEARS* • SOUTH BEND 22, INDIANA, U. S. A.

Just ONE Example... OF HOW MANUFACTURERS OBTAIN...

with

BARNESDRIL HONERS



● Internal Surfaces of Diesel Engine Cylinder Liners Finish Honed in 16 Minutes at The Baldwin Locomotive Works...

Internal finishing of Diesel Engine Cylinder Liners is being accomplished at The Baldwin Locomotive Works in 16 minutes, floor-to-floor time, on the BARNESDRIL Honer shown above. These Liners have a 12¾" bore and measure 32½" in length. Stock removal is .006" radially or .012" on the diameter and the manufacturer reports that mirror finish is obtained and extremely close tolerances held.

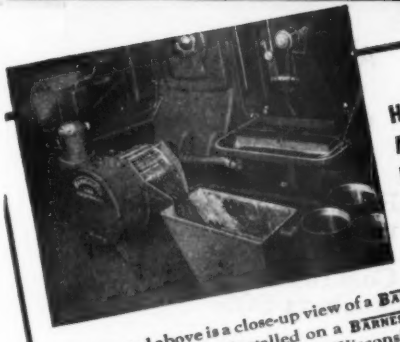
Why Industry is Turning to Honing

To insure maximum production, greater accuracy and mirror smoothness on finishing operations, The Baldwin Locomotive Works is but one of the many manufacturers turning to the BARNESDRIL Honing Method. BARNESDRIL Honing Machines are built in vertical, horizontal and angular types with single or multiple spindles for work up to 42" in diameter and 75 feet in length. Finish accuracy of .0005" can be obtained on BARNESDRIL Honers and, in high speed production, surface finishes of 2 to 3 micro inches are maintained.

Using your production requirements and the design of your workpiece as a basis, BARNESDRIL engineers will be glad to recommend the honing machine that can be most profitably adapted to your finishing operations. Call on them today. No obligation.

ADDITIONAL DATA...

For more complete information on the BARNESDRIL Honing Method, send for your free copy of Bulletin A-121.



HOW ONE MANUFACTURER IS USING THE BARNESDRIL COOLANT SEPARATOR

Illustrated above is a close-up view of a BARNESDRIL Magnetic-Automatic Coolant Separator, installed on a BARNESDRIL Honing Machine at the Heil Company in Milwaukee, Wisconsin. The Separator operates on the principle of magnetic attraction and removes foreign matter from coolant automatically. Heil states that the BARNESDRIL Separator removes an unusual amount of swarf and reduces the number of rejected workpieces. Learn how you, too, can use the BARNESDRIL Separator to advantage. Write for free copy of Bulletin M.

Installation view of BARNESDRIL *307 Hydraulic Honer used for reconditioning aircraft cylinder barrels. Honer is equipped with trunnion type, tip-over fixture for facilitating inspection of internal surfaces of cylinder.*

Barnes Drill Co. 830 CHESTNUT STREET ROCKFORD ILLINOIS, U.S.A.

LANDIS TOOL
CENTERLESS THREAD GRINDER

11,900 More Screws Per Day

From Solid Hardened Stock

BY NEW CENTERLESS THREAD GRINDING

The new centerless method of grinding threads, made possible for the first time by the LANDIS TOOL Centerless Thread Grinder, has proved itself by a year's trial in actual production of socket set screws.

Comparison of production on the LANDIS TOOL Centerless Thread Grinder over previous methods for identical socket head screws ¼"—20 x ½" showed an increase of 5.67 times in production. On a cost comparison, unit costs were reduced approximately 80%. Reasons for this big advantage in production include—faster production due to thru feed; longer production runs with less time out for tool maintenance; greatly reduced inspection needs because of slow wheel wear; rejects caused by heat treating distortion are eliminated.

LANDIS TOOL Centerless Thread Grinders are especially well suited for the production of socket set screws. There are many other ground thread applications where centerless thread grinding may be used. Our engineering department will be glad to make recommendations.

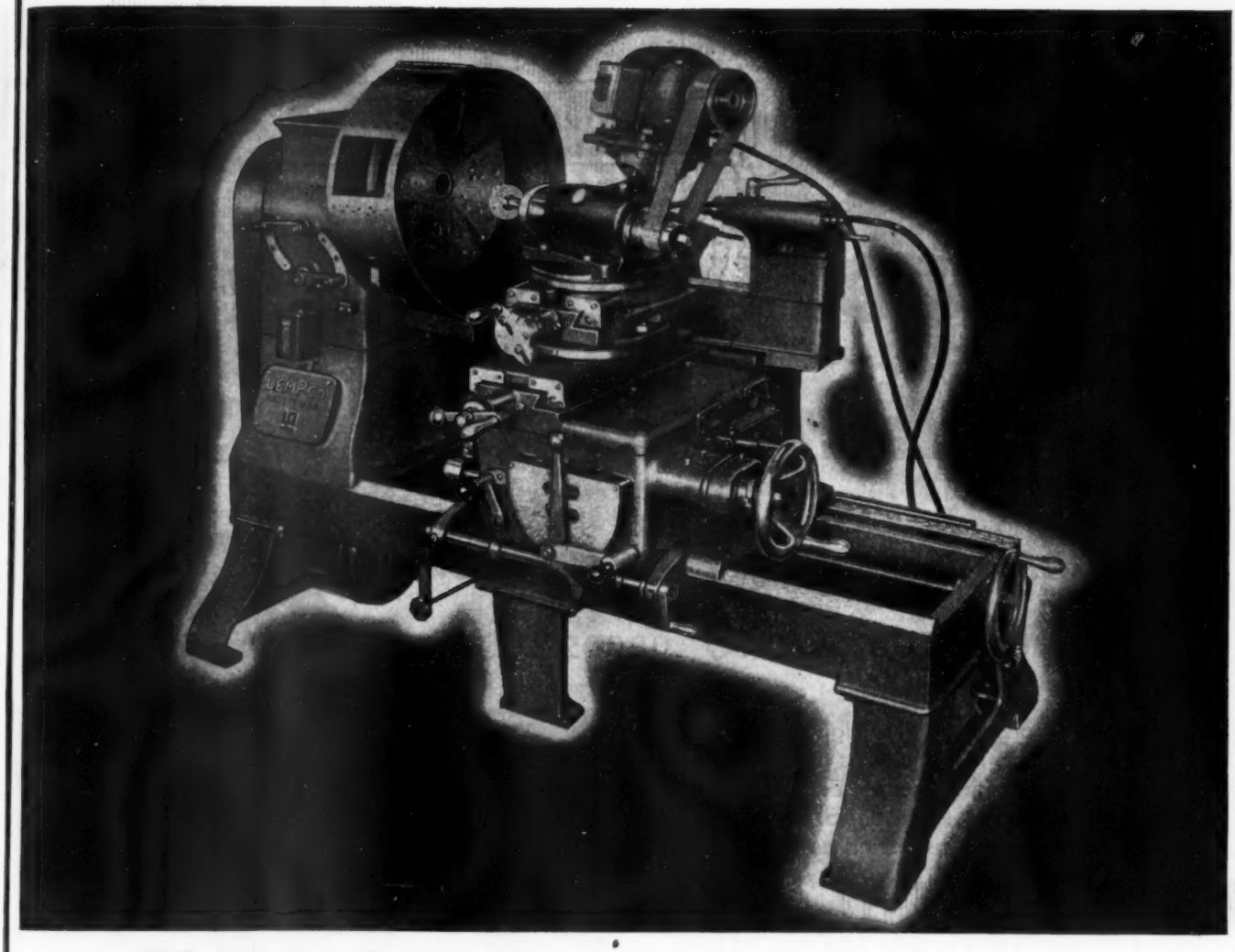
LANDIS TOOL COMPANY • Waynesboro, Pa.

ADVANTAGES
Over
Other Methods

- Production increases up to 500%
- Cost reduction as much as 80%
- Fewer rejects
- Less inspection
- No burrs
- Bright finish
- Perfect thread form
- Perfect lead control
- Better starting thread

LANDIS TOOL
Precision Grinders

24AS



SWING HIGH — SWING LOW . .

. . . in fact, the Lempco Model HGX Heavy-Duty Universal Grinder has a big 53" swing! To our knowledge it's the only grinder in its price class with such a large swing that also turns and grinds internal, external, face, and taper jobs. Four quick selective spindle speeds; three each quick-change table and cross feeds, automatic in both directions. Matched pre-loaded pairs of balanced precision ball bearings used in each end of the heavy-duty spindle. Spindle head and tool bar unit quickly and easily interchangeable. Good delivery.

SPECIFICATIONS

Length, over all	6' 4½"
Length of Bed (Std.)	5' 11½"
Width, over all	46½"
Max. Distance between Work Centers	44"
Swing, over ways (Dia.)	53"
Grinding Range (Max. i.d.)	29"
Grinding Range (Max. o.d.)	18"
Grinding Range (Max. depth)	12"
Turning Range (Max. i.d.)	48"
Turning Range (Max. o.d.)	22"
Turning Range (Max. depth)	12"
Min. Grinding or Turning Range	2"*
Face Plate Dia.	18"
Table Slide Travel	12"
Cross Slide Travel	12"
Carriage Travel	19"

**Less with special equipment.*

WRITE FOR CATALOG

LEMPCO

5711 DUNHAM ROAD • BEDFORD, OHIO, U. S. A.

New! STANDARD

COMPARATOR

DIAL SNAP GAGE

PATENT APPLIED FOR

Lighter weight... Easy to handle

ACCURATE TO .00002"

Comparator accuracy is brought right to the machine — in an instrument as light in weight as the ordinary snap gage. Easy to handle and easy to operate. No special skill needed. It can improve your inspection as well as your production.

6 Important Superiorities

Spherically surfaced upper anvil with flat lower anvil facilitates setting without danger of out-of-parrallelism. Also available with flat-shaped anvils for checking close to shoulders.

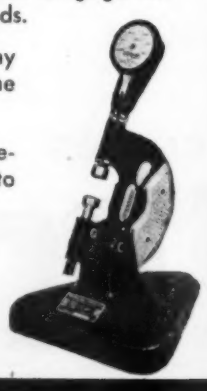
Upper anvil of wear-resistant cemented carbide; lower anvil (flat-lapped serrated surface) tipped with cemented carbide. Chips and dirt readily clear from this surface.

STANDARD Shockproof dial indicators furnished with these gages are an important factor in their *superior* accuracy.

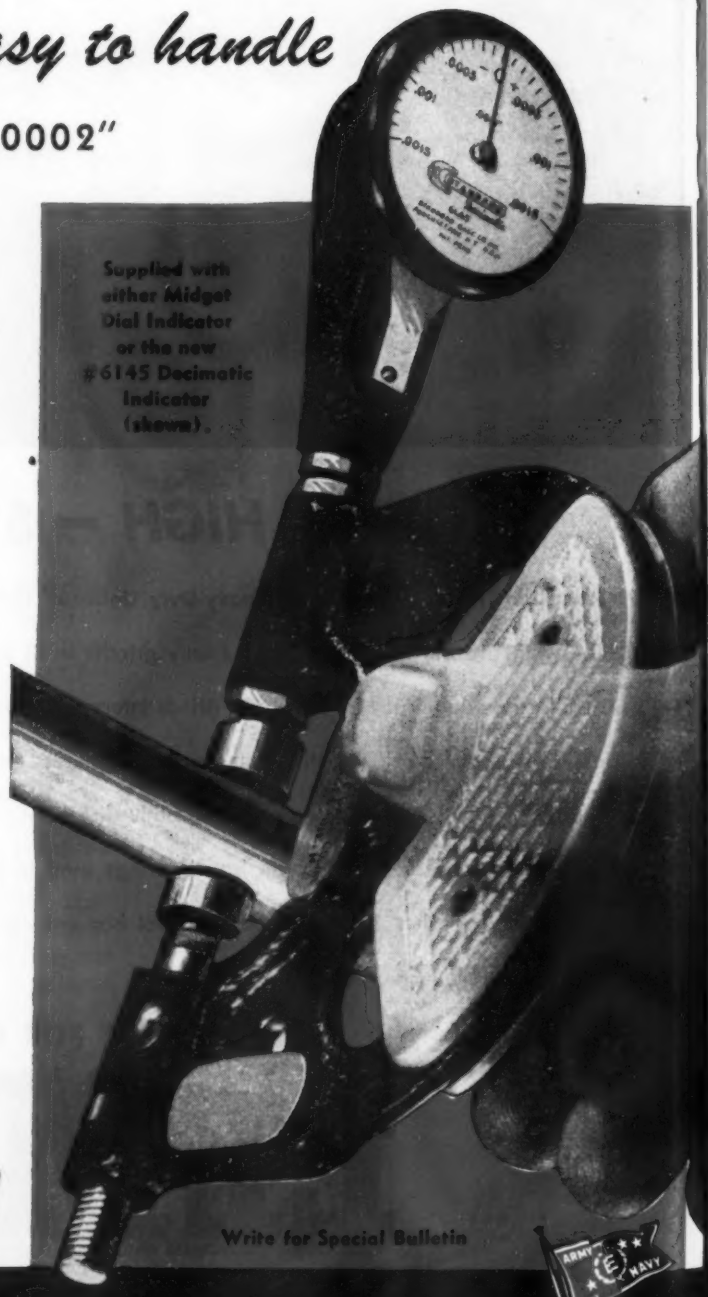
Thermal grip insulated from gage body by air space. Heat of operator's hand has little effect on gage setting, even when used over long periods.

Dial indicator may be faced in any direction to permit reading from the most convenient angle.

Indicator graduated in .0001". Dependable readings can be made to .00002".



Eight sizes, each with a range of 1", cover range of 0" to 8". First three sizes can be used in bench stand for bench inspections. Sizes above 8" to order.



Supplied with either Midget Dial Indicator or the new #6145 Decimatic Indicator (shown).

Write for Special Bulletin

ARMY E NAVY

STANDARD GAGE CO., Inc., Poughkeepsie, N.

Continued

Grinding Questions Answered

By Allen Steele, Manager, Dayton Grinding Wheel Division
SIMONDS WORDEN WHITE COMPANY

This series of questions and answers is presented as a practical aid in the solution of many of the more common grinding problems. Readers are invited to send in their own grinding questions, without obligation of any sort. All questions will be answered by mail or in this column. No identities will be revealed if published.

24 Q. *"How many different kinds of coolants are there? It seems to me there is a new one every day."*

A. There are a great many different brands of grinding fluids or coolants and no doubt all of them differ in one way or another. Basically, however, all grinding fluids can be classified somewhere within the following types: (1) Plain water; (2) plain soap solutions; (3) straight mineral oils: (4) plain water and sodium carbonate; (5) emulsions of oil and water; (6) emulsions of paste compounds.

25 Q. *"What is meant by the term 'outboard roller support' method in infeed centerless grinding?"*

A. The term outboard roller support method in infeed centerless grinding is applied to work where the piece is longer than the width of the wheels and is ground but a short distance from the ends. The protruding end of the work is supported by the means of rollers which are generally outside the machine. These rollers are called "infeed roller work rests" and are considered a part of the fixture. The operation cycle is the same as for ordinary infeed grinding.

26 Q. *"Can you give me the reason why grinding oils are preferable to ordinary coolants on thread grinding jobs?"*

A. The chief advantages of using a grinding oil in preference to an ordinary coolant on thread grinding jobs are: (1) the wheel cuts more freely without breaking down; (2) permits the use of a much finer grain or grit; (3) temperature of the work is more easily maintained at a low point.

27 Q. *"We have a small cylindrical grinder using an 8 x ½ x 1 wheel. We have a number of high speed steel shafts to grind ranging in diameter from ⅜" to ⅝". Up to the present time, we have not been able to do a very good grinding job on these shafts. Do you think you have a wheel that will give us the performance we want?*

A. We are presently supplying Dayton wheels to a number of plants which are doing work similar to yours. We would like very much to have you try our 8A-60-L-15-V-25 (old marking 860 L-1-V).

28 Q. *"In setting up a centerless machine for infeed grinding at what angle should the regulating wheel be set?"*

A. The recommended angle for the regulating wheel in infeed grinding is approximately one-half degree to the grinding wheel.

29 Q. *"What are the advantages and disadvantages as between 'dry' and 'wet' cutting-off operations?"*

A. As between "dry" and "wet" cut-off operations, the "dry" is generally considered the much faster method, due to the fact that a faster wheel speed can be used and therefore, the rate of cut is faster.

The advantages of the "wet" cut-off operation are: (1) reduces wheel wear by about 50%; (2) practically eliminates burr and discoloration, provided the wheel is properly selected; (3) leaves the cuts bright and clear; (4) permits a more frequent use of rubber bonded wheels, thus effecting a saving in wheel costs.

30 Q. *"If it is dangerous to operate a grinding wheel at a speed faster than the speed recommended by the wheel manufacturer, is there any reason why it shouldn't be operated slower than the recommended speed?"*

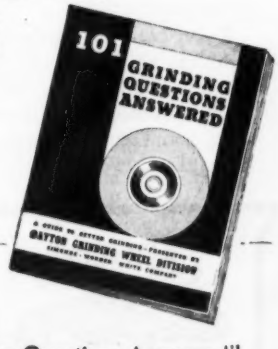
A. The wheel speed recommended by the manufacturer not only takes the safety factor into account, but is also the most efficient speed for a given job. If it is operated considerably slower than the recommended speed, there is a wastage of abrasive without getting much useful work in return.

31 Q. *"When centerless grinding pieces with a very small diameter, what blade material do you recommend?"*

A. A high speed steel blade is perhaps best adapted for grinding pieces of very small diameter on a centerless machine.

READY NOW... a guide to better grinding!

101 "Answers" to everyday grinding problems—indexed for quick, easy reference—will be sent FREE to anyone interested in better grinding practices. Just fill in and mail coupon below.
SIMONDS WORDEN WHITE CO., DAYTON 7, OHIO.



DAYTON GRINDING WHEELS

SIMONDS WORDEN WHITE CO.,
712 Negley Place, Dayton 7, Ohio

Please send me Free Booklet "101 Grinding Questions Answered"

Name_____

Firm_____

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City_____ Zone_____ State_____

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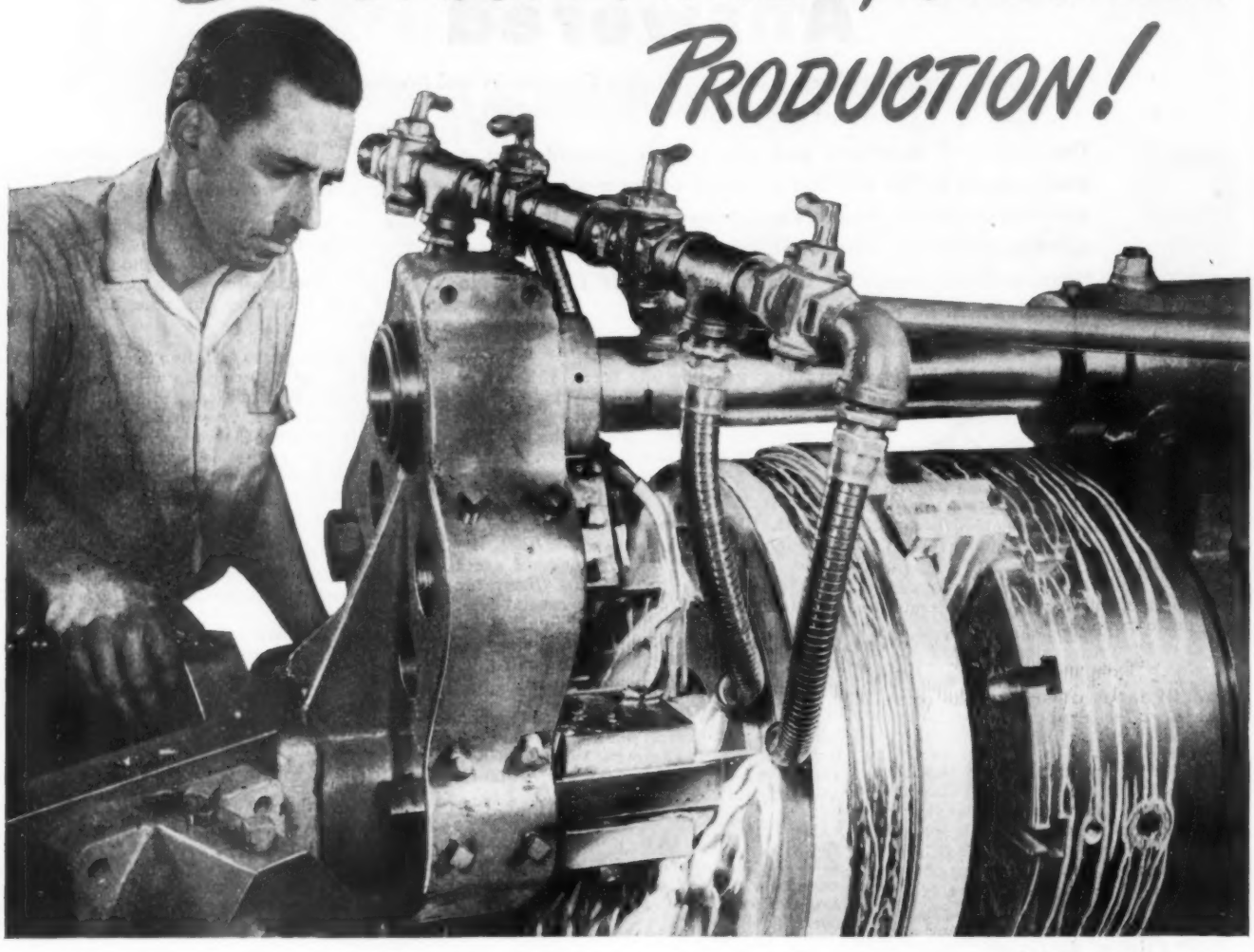
Select the correct S/V Solvac Oil for

SUPERIOR FINISH, GREATER PRODUCTION!



TODAY, in the complete S/V Solvac line, Socony-Vacuum offers you a wide selection of highest quality soluble oils to assure superior finish and maximum production on your metal-cutting operations.

Every one of these outstanding products gives you the vital fundamentals of all soluble oils—good rust resistance, non-gumming properties, exceptional emulsifying characteristics and stable emulsions. In addition, with the selection of the correct grade oil, you get maximum pressure resistance, lubricity and cooling properties for your specific jobs.

For instance, on heavy-duty jobs like the operation shown in this picture, S/V Solvac Oil 410 provides the extreme pressure resistance and high lubricity needed. Where pressures are great but not extreme, S/V Solvac Oil 538 may be the answer. For moderate pressures, S/V Solvac Oil S usually meets the need, and for light pressures and high speeds, it's S/V Solvac Oil 1535.

Call your Socony-Vacuum Representative. Let him help you select and apply the correct S/V Solvac Oil for your specific operations.

SOCONY-VACUUM OIL CO., INC.
Standard Oil of N. Y. Div. · White Star Div. · Lubrite Div. · Chicago Div. · White Eagle Div. · Wadhams Div. · Magnolia Petroleum Co. · General Petroleum Corporation of California.

GARGOYLE Lubricants

SOCONY-VACUUM'S 5 Steps to Lower Production Costs:

1. Lubrication Study of Your Entire Plant
2. Lubrication Schedules and Controls
3. Lubricant Storage and Handling System
4. Skilled Engineering Counsel
5. Progress Reports of Benefits Secured

TUNE IN "INFORMATION PLEASE"—MONDAY EVENINGS, 9:30 E.W.T.—NBC

VISHWAKARMA

. . . the Blessing of the Machines

From far off India comes an interesting report by the toolroom foreman of a large industrial plant. Once a year, a day is set aside for the annual VISHWAKARMA Festival wherein blessings are invoked upon the factory equipment.

According to ancient custom, a fire is lighted in the morning into which various foods are scattered as an offering. In the afternoon the residue is used to mark the machines with various religious signs, while a Brahmin performs the blessing.

One by one the machines are then gaily decorated with flowers, garlands, and flags and are pronounced ready for operation during the coming year.

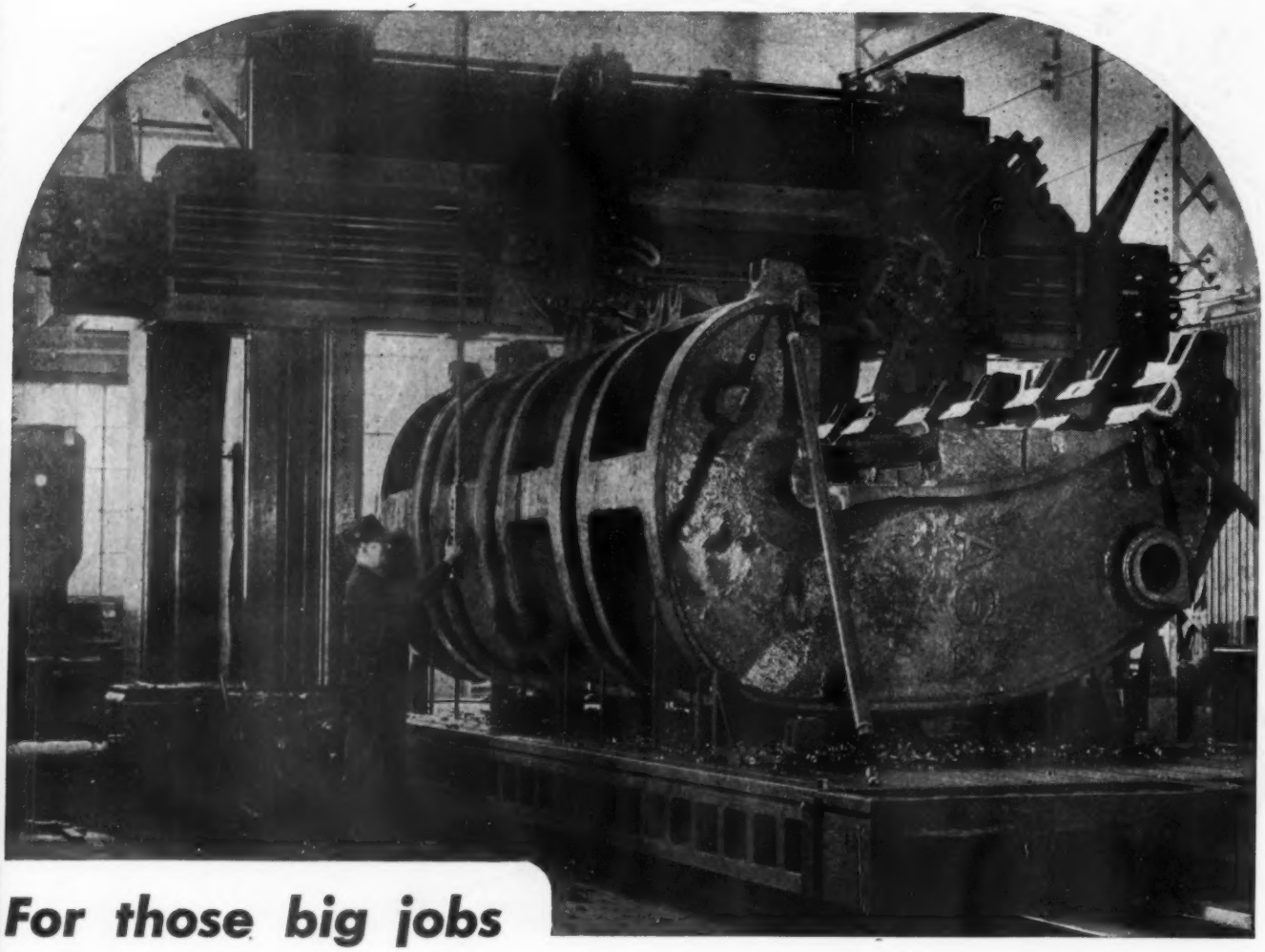
What particularly interested us at Pratt & Whitney is the fact that several of our jig borers were among the machines so blessed . . . one more illustration of the extent to which Pratt & Whitney accuracy is in service throughout the world.

For regardless of geographical location, regardless of the conditions under which work is performed and the workers who operate the machines—*there is no substitute for accuracy.* For 85 years, this has been the prime requisite of every P&W machine tool, small tool, and gage.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT



For those big jobs

GRAY *Double Housing Planer*

● Illustrated is a Gray 12 ft. x 10 ft. x 30 ft. Double Housing Planer machining pads on four Niagara Press columns. Note that both heads are cutting simultaneously on the upper and lower pads of all four columns.

This is typical of the wide range of planer operations being performed daily in hundreds of plants. Dual electric controls facilitate operation from either side of the machine.

A distinctive feature of Gray design is also of great value on this job. Due to the long harp construction, the rail can be clamped close to the work, even when using long reach tools, as the slide can be run up on the harp without sacrificing length of bearing. This insures maximum rigidity and accuracy throughout the length of the cut.

Bulletin 40-R-3 contains complete information on all standard size planers from 36 inch x 36 inch x 10 ft. up to 72 inch x 72 inch x 12 ft. *Write for a copy.*

THE G. A. GRAY COMPANY

3610 WOODBURN AVENUE • • • CINCINNATI 7, OHIO, U. S. A.

THE GRAY LINE — Double Housing and Openside Planers, Switch Planers, Die Block Planers, Double-Housing and Openside Milling Planers, Planer Type Milling Machines, Horizontal Boring Machines.

LOST

We are all the little boys and girls whose fathers have been killed at war . . . and will never come home again.

We who are lost ask only this of you: Please, please buy another bond.

Buy it and keep it—for our sake.

Contributed by Bryant Chucking Grinder Company, Springfield, Vermont, U.S.A. Reprints sent on request.

The JIGMIL has proven to be a totally new approach to the problems of economical precision BORING and milling of tool and production work

THE fastest producing and most accurate machine in the field.

Many users are reporting consistent experience of two to three times the output and higher quality work.

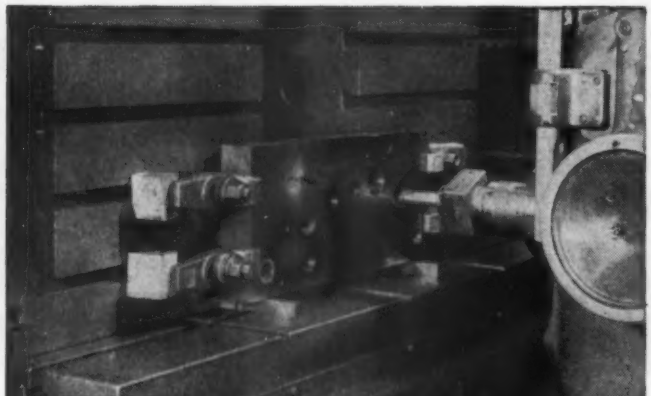
Automatic positioning of spindle from one location to another in response to measuring rods and push buttons to within less than .0001 (one ten-thousandth part of an inch).

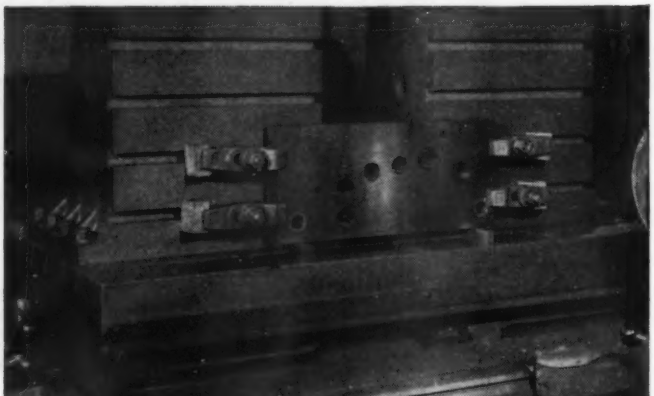
Feather touch, pressure controlled slide locks that positively control locking uniformity, so essential to high precision work.

Unique operation and controls that make possible high precision work with relatively little skill.

★ ★ ★

JIGMIL—The world's finest BORING and milling machine is made in Detroit.





★ **No. 1—Illustration showing convenience of jig plate boring. No. 2—Eight holes precision bored. Holes spaced within .0001 with total dependence of all spacing on automatic positioning means.**

DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**

PARTNERS FOR VICTORY

Yes, we are all partners for Victory. Hi-'Q,' symbol of the spirit of our company, also symbolizes all American Industry and the team work which exists between it and the Armed Forces.

The power and success of this combination is now a matter of record in all theaters of action . . . records written in blood, sweat and tears.

It is the earnest hope of men everywhere that the purpose for which this relationship was formed may soon be completely achieved by these Partners for Victory!

Stay with It . . . Buy War Bonds

QUALITY TOOL & DIE CO.

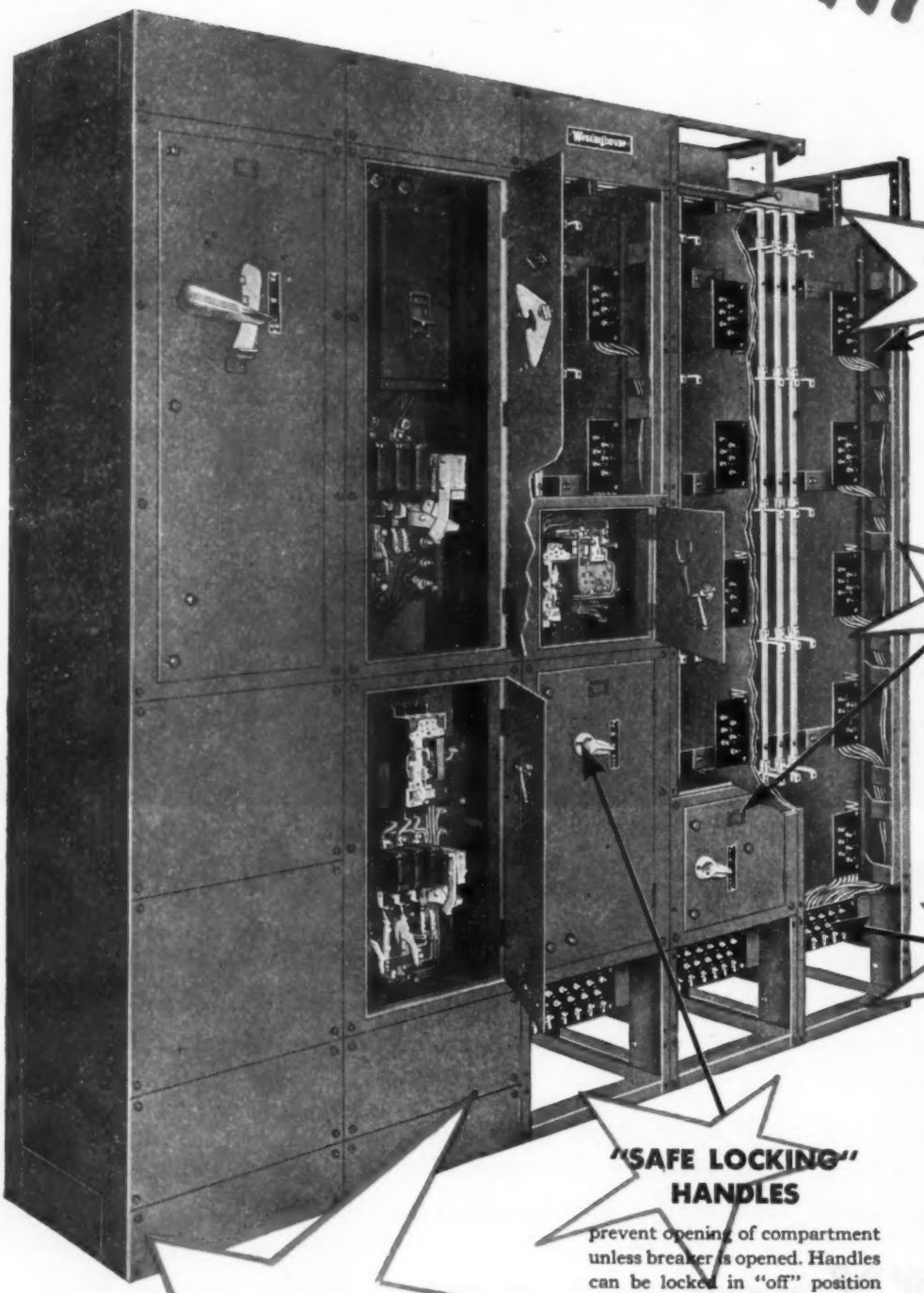
Manufacturers of "Quality" Products

401-15 NORTH NOBLE STREET, INDIANAPOLIS 2, INDIANA

ARMY NAVY

EST. 1929 QUALITY TOOL-DIE CO.

Easier to install



ACCESSIBLE VERTICAL WIRING TROUGH

in each unit facilitates rearrangement of individual units and simplifies wiring, should master terminal boards not be desired.

STARTER UNITS EASILY REMOVED

from front of structure for relocation or maintenance—provides new operating flexibility.

MASTER TERMINAL BOARD

conveniently located at bottom (or top) of a control center, simplifies connection of outgoing leads. Individual terminal boards make wiring easy to identify, simple to change—connections between starters and master terminal boards made at factory.

"SAFE LOCKING" HANDLES

prevent opening of compartment unless breaker is opened. Handles can be locked in "off" position with from one to three padlocks.

FRONT OR BACK-TO-BACK MOUNTING

. . . twice the number of units can be installed without increasing depth of structure when back-to-back mounting is employed.

FOR ANY CONTROL CALL WESTINGHOUSE

WESTINGHOUSE

...easier to maintain...

Application and operating flexibility of Westinghouse Control Centers saves man-hours in installation . . . and maintenance . . . saves space with diversity of mountings.

A big reason why Westinghouse Control Centers are easier to install and maintain is simplicity of design. It simplifies control center problems from planning, ordering . . . down to the last item of maintenance. Regardless of the diversity of ratings required in one structure, a Westinghouse Control Center (built from standardized units) is available. There are three basic reasons for this flexibility:

1. *Standardized dimensions* of the main structure and of individual units. Size 1, 2, 3 and 4 linestarters are mounted in the same sheet steel structure—only section heights vary.

2. *Standardized terminal board system* simplifies wiring because all internal connections are made at factory—all outgoing connections are conveniently located on master terminal board at top or bottom of starter.

3. *Individual starter units* or sections can be rearranged quickly. Units can be installed anywhere in the structure, in any combination.

Because of this complete standardization . . . of every part . . . Westinghouse Control Centers result in much lower over-all cost than made-to-order multimotor control panels. These are only a few advantages of standardized prefabricated Westinghouse Control Centers. All units are standard Westinghouse control items . . . offering the benefit of the half century of Westinghouse control experience. For information, write your Westinghouse office. Ask for Booklet B-3026. Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. J-60599

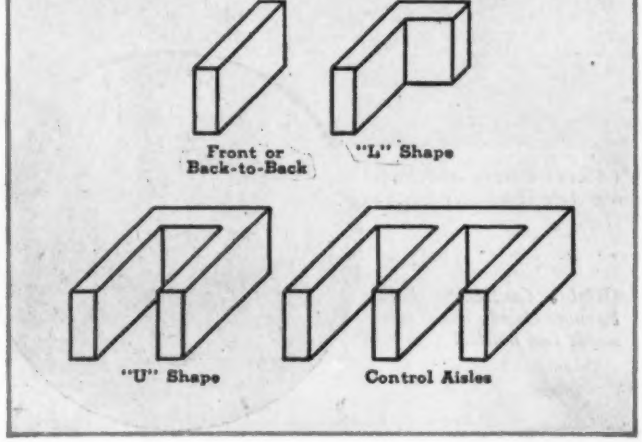
ALL INDIVIDUAL UNITS EASILY REMOVED

It's easy to remove an individual unit—a self-contained combination linestarter (circuit breaker and magnetic across-the-line starter)—just remove line and load leads and loosen four corner screws on trim. Entire unit then slides out for inspection or replacement. Each unit is completely baffled.

Only Westinghouse Control Centers Offer All These Advantages:

- Full installation and operating flexibility—all units 20 inches wide.
- Simplified maintenance, because of centralized, easily accessible controls.
- Smart, modern appearance.
- Standardized structures, permitting easy addition of control units.
- Full mounting flexibility. Starters can be mounted front only, or back-to-back.
- Complete operating safety assured by "safe locking" handles.

TYPICAL ARRANGEMENTS POSSIBLE WITH WESTINGHOUSE CONTROL CENTERS



Westinghouse CONTROL CENTERS

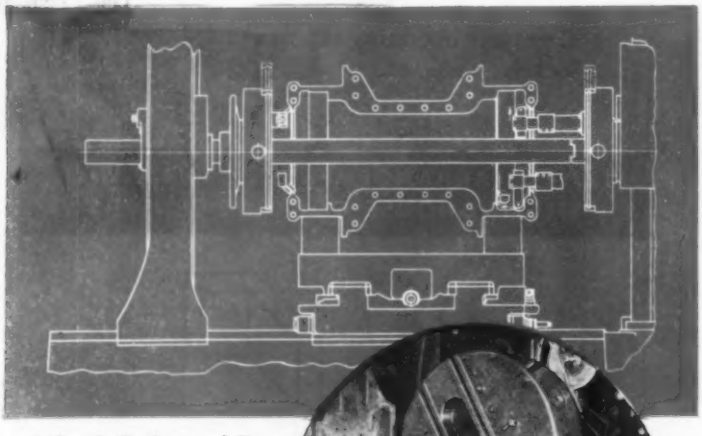
"how to do it"

SPECIALIZED MACHINING

Instead of having a number of expensive individual machines for single machining operations, the Giddings & Lewis Horizontal Boring, Drilling and Milling Machine offers an economical and practical solution to many special building, repair and maintenance problems in railroad shops. The wide variety of work which can be handled, coupled with machine flexibility, makes the G. & L. especially needed in round house, engine house and back shops. The initial cost of this multiple purpose machine favors its use.

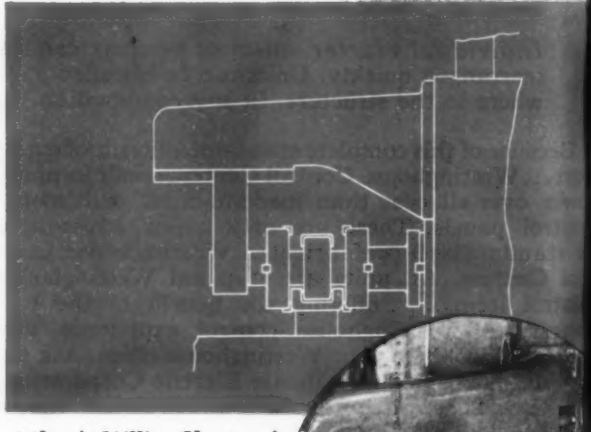
SINGLE PURPOSE MACHINES UNNECESSARY IN MANY SHOPS

A few shops are equipped with special machines for quartering drivers, turning wheels, boring cylinders, channeling rods, milling shoes and wedges and other difficult jobs. Most shops, however, do not have single purpose machines for such a variety of work. In instances of breakdown on the road, it is often necessary to make repairs in shops hundreds of miles from the point of actual breakdown. As a result, locomotives may be tied up for many days, whereas such re-

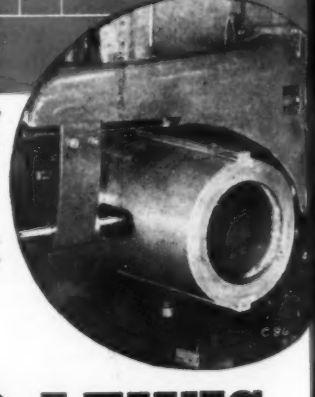


(Above) Boring and Facing Axle Housing.

(Right) Continuous Feed Facing Head with telescopic tool holder.



(Above) Milling Shoes and Wedges. Note arbor support.

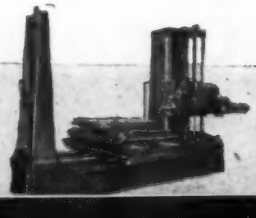


(Right) Typical arbor support used in machining large shaft.

G&L

GIDDINGS & LEWIS

138 DOTY STREET



Right: G. & L. Table Type Machine.

Right: G. & L. Floor Type Machine.

MORE

RAILROAD IN LESS TIME . . ."

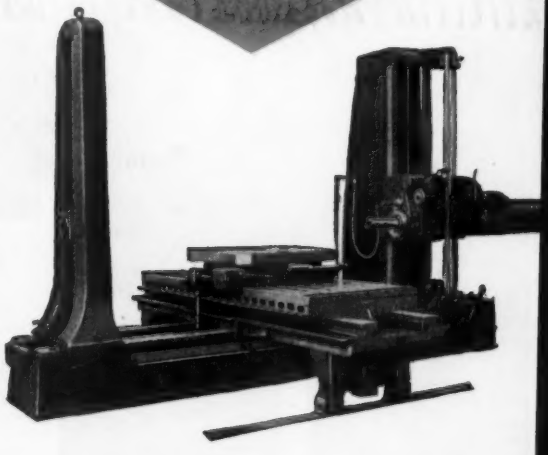
pairs could be easily handled in any shop on standard G. & L. machines equipped with standard attachments. Using such equipment reduces down time to a minimum and places the locomotive back on the road days ahead of schedule.

More Work in Less Time

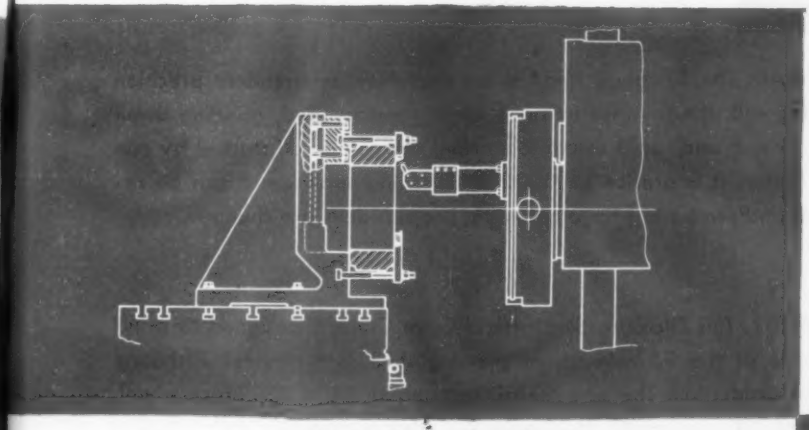
Present conditions in railroad shops make it essential to produce more in less time. The simplest means of increasing production is to use the versatile G. & L. Horizontal Machine and time-saving accessories. If you have not already consulted our engineers regarding the use of Giddings & Lewis machines, it will be advantageous to submit your railroad machining problems now.

Standard G. & L. Horizontal Boring, Drilling and Milling Machine Does Difficult Round House, Engine House and Back Shop Jobs

usually handled on single purpose machines



G. & L. Horizontal Boring, Drilling and Milling Machine with extended saddle, supports and rotary table.



Boring Locomotive rod ends.

Free Additional Data

—descriptive of railroad machining operations is presented in "Railroad Shops." Write for your *free* copy today and we will include information on the complete line of Giddings & Lewis machines and time-saving accessories. Ask for Bulletin No. AM-65.

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571 Washington Blvd. at Jefferson
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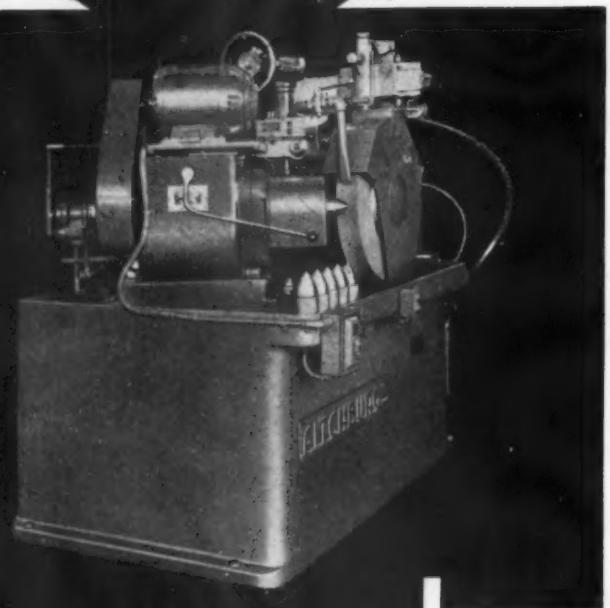
Other interesting and time-saving railroad machining practices will be described in later issues of this publication.

Left: G. & L. Planer Type Machine

Left: G. & L. Multiple Head Type Machine

Use THE FITCHBURG BOWGAGE HEAD TO GRIND IT *Cheaper, faster, better*



Just as multiple tooling and combined cuts increased production profits of machined work in mass production, the Fitchburg method of precision grinding cuts additional cost factors from every piece, saves on production and equipment.

Designed on an entirely new principle of precision grinding, the Fitchburg head is a completely self-contained and independent grinding unit. It may be installed singly or in multiples to operate simultaneously or consecutively in mass production. It also may be installed to modernize any equipment.

Get the facts — you will instantly make a favorable comparison between Fitchburg Automatic Precision grinding and any other method. Install a Fitchburg now, and use your "Head" to cut costs and speed production. Send your blueprints for our engineers' recommendations — there's no obligation.

THE HEAD. *The Bowgage Head* is a completely independent precision grinding unit. It has rapid traverse, slow grinding feed, grinding dwell or spark out, and rapid return to starting position — all started by one push button. It is precise to .0002″, minimizing spoilage. It can be removed and remounted for other work, if operations are changed.

THE BODY. *This Fitchburg Single-Head Ojive Grinder*, designed to grind the ojive of the 75 MM armor piercing shell, is typical of Fitchburg cut-cost production. The wheelhead, carrying a 24″ x 3½″ face wheel, is completely automatic. It is mounted with a hydraulic form trueing device to true the face of the grinding wheel at the proper radius for the nose of the shell. The workhead is equipped with a parallel-motion jaw-chuck, operated by a hydraulic cylinder at the back of the workhead.

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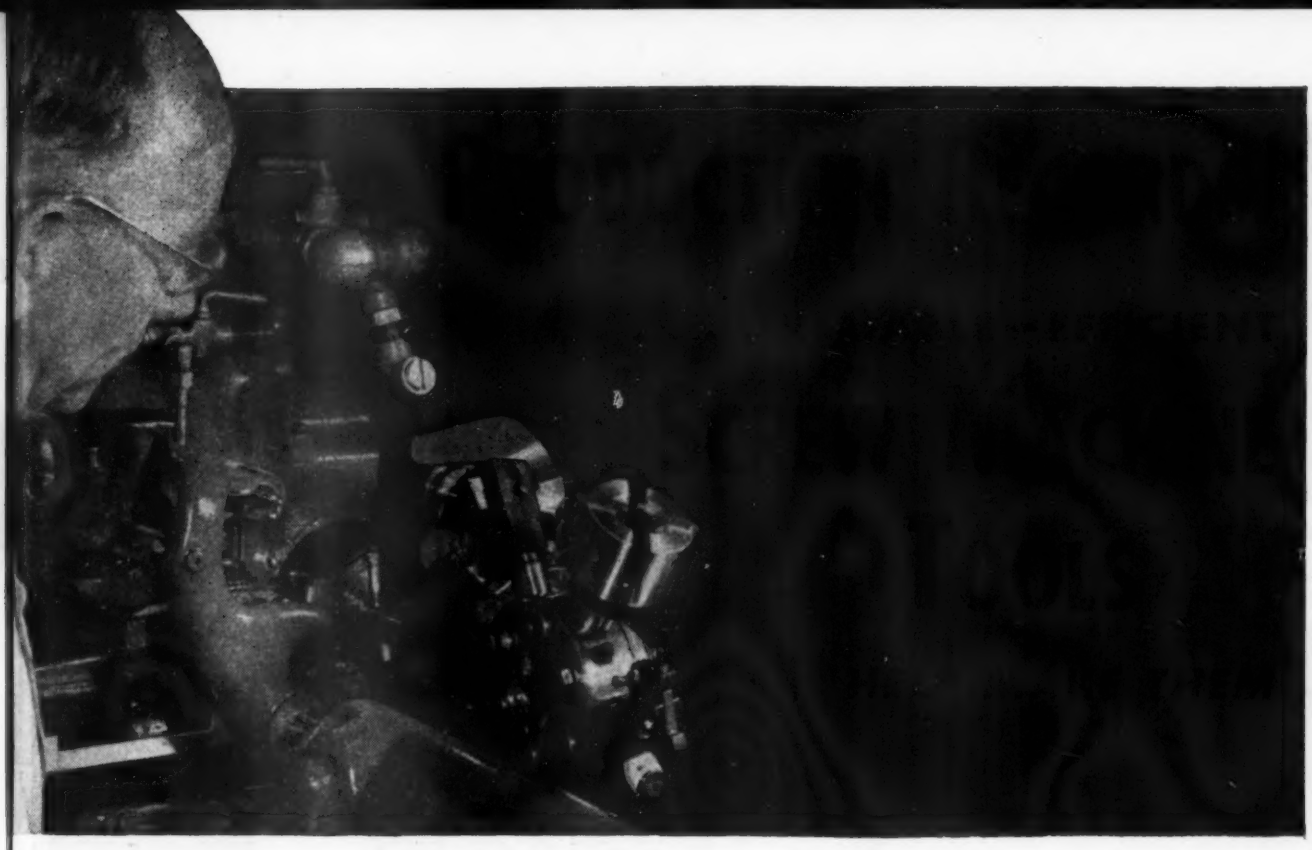
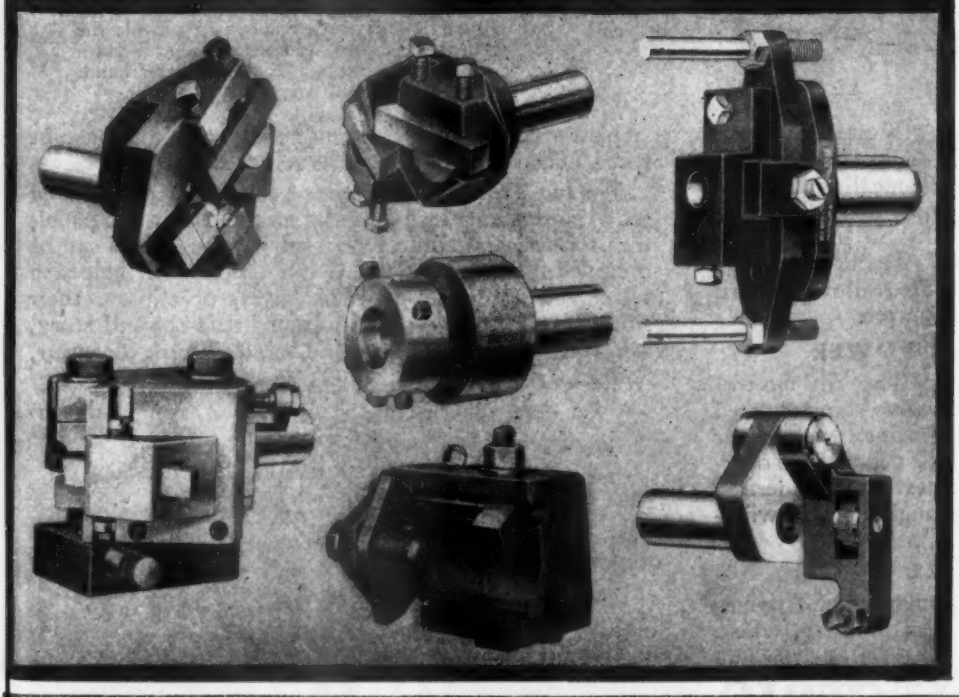


THE STURDY, convenient designs, ease of adjustment and selected cutting steels of Brown & Sharpe Screw Machine Tools all contribute to a performance that means maximum output.

These outstanding advantages result not only from long experience in the manufacture of screw machine tools but from experience in the daily use of thousands of tools as well. Operators find in them features of design and construction which simplify setups and permit maximum machine capacity. Catalog No. 34 listing complete line sent on request. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.



There's a Brown & Sharpe Screw Machine Tool For Most Screw Machine Needs

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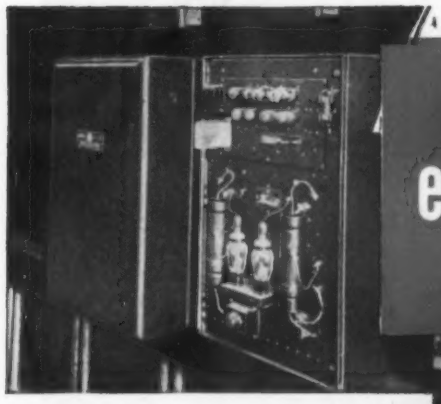
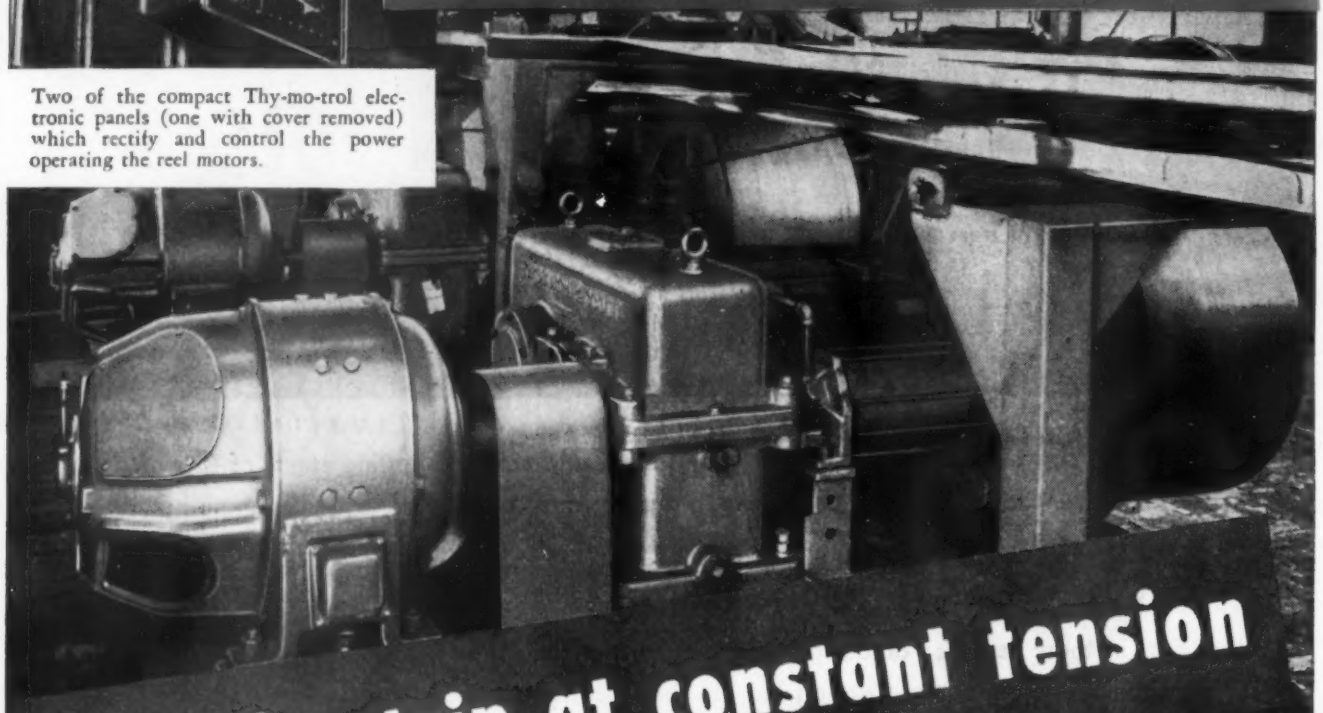


Two of the compact Thy-mo-trol electronic panels (one with cover removed) which rectify and control the power operating the reel motors.

electronic self-adjusting drive



...coils strip at constant tension

Thy-mo-trol d-c drive motors (400/1600 rpm) operate through speed reducers to provide the required reel speed. Motor field-control automatically reduces speed as coil diameter builds up, holding tension constant.

At Allegheny-Ludlum Steel Corp., West Leechburg, Pa., smooth, constant-tension coil winding is now possible on the delivery reels of strip-annealing furnaces. The mechanical problems of slip-clutch operation have been eliminated. Full flexibility to handle strip speeds from 3 to 12 fpm is provided. The drive adjusts itself to the speed changes required to allow for coil build-up from 16 to 40 inches in diameter.

OPERATES FROM A-C POWER

Operated from an a-c power source, 2-hp Thy-mo-trol drives on these small reels give the same stepless speed control and torque control that is obtained with larger d-c adjustable voltage systems on mill drives. The operator sets a tension-adjusting rheostat at the desired value, and this level is held throughout the wind-up of the coil.

WIDELY APPLIED

This is only one of the increasing number of Thy-mo-trol applications throughout the steel industry, where stepless speed control, constant acceleration, or constant speed under changing loads is required.

You buy Thy-mo-trol drive as a complete, co-ordinated set of equipment, including d-c motor, electronic panel, transformer, and control station. *Standard* drives can be obtained from 1/8 to 25 hp. G-E engineers will help you select and apply Thy-mo-trol drives, or explore their suitability for new types of jobs. To read the full story, ask for Bulletin GEA-4025. *General Electric Company, Schenectady 5, N. Y.*

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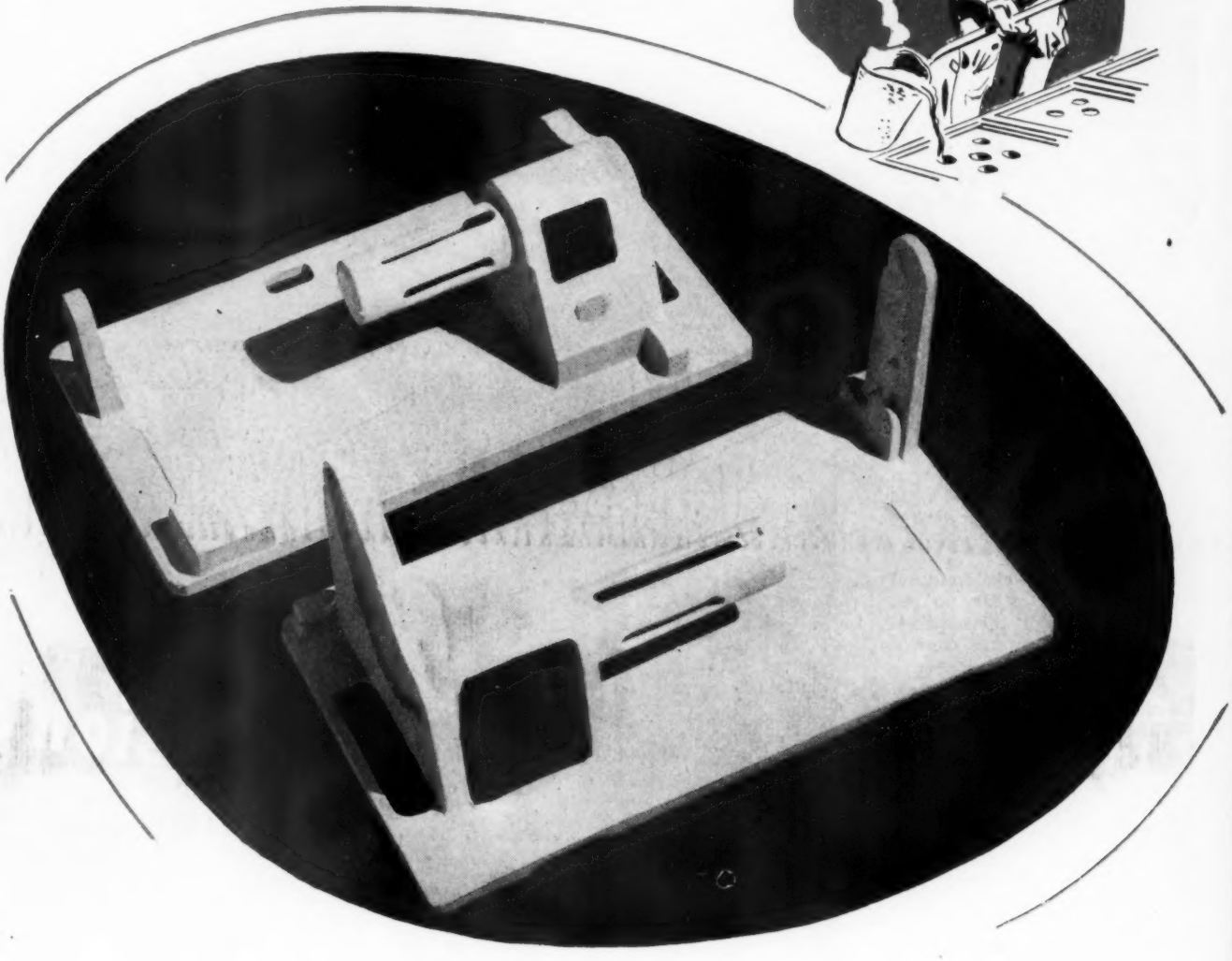
Buy all the BONDS you can—*and keep all you buy*

THY-MO-TROL DRIVE

They started in sand...



...now they're permanent-mold castings, being produced by Alcoa for Dictaphone

A lightweight machine was an innovation, public acceptance unknown, when Dictaphone first decided to use aluminum for these parts. Alcoa, therefore, started producing the parts as sand castings; it's much easier and less expensive to make design changes in patterns than in metal molds.

The lightweight Dictaphone took hold quickly. Quantities soon reached the range where it was more economical to produce parts as permanent-mold castings. Molds were made and Alcoa went into production. Today, Dictaphones are playing an important part in speeding military and civilian paper work.

If you're wondering about ways of helping your production, it should pay to consult Alcoa on the use of light metal permanent-mold castings. Write ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA FIRST IN **ALUMINUM**

ALCOA ALUMINUM

TO BRING MACHINES

Up to par

Control properly selected and applied makes it easy to put motors through their paces. Westinghouse motor control not only covers the entire range of standard a-c and d-c controls and accessories for every type of drive, but many specialized types of control.

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TWENTY-ONE OTHER WAYS your Westinghouse Distributor can help you in planning electrical modernization, whether for a single department or your entire plant, are suggested in this new book. It provides a valuable check list on modern electrical practices . . . from incoming electrical power to methods of utilization and control. Ask your Westinghouse Distributor today for a copy of B-3476, or write Westinghouse Electric & Manufacturing Company, P. O. Box 868, Pittsburgh 30, Pa.

For efficient, trouble-free speed reduction within the standard range of 1 to 75 hp—use a Westinghouse Gearmotor. You buy your power *pre-packaged* at the speed you want—ready for simple, instant assembly.

Bought now, Westinghouse Type CSP prelubricated motors need no greasing till 1950! Extensively field tested, prelubricated ball bearings in Westinghouse CSP general-purpose motors have proved they can operate five years . . . 24 hours a day . . . without greasing. This feature is standard on CSP motors up to 3 hp.

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Motors, like people, can be square pegs in round holes. You may have improvised but you will need motors that are "job-fitted" to compete with the newly-built, highly efficient war plants.

Your Westinghouse Distributor is equipped to help you. He will make a thorough survey of your motor drives, plus a full electrical checkup of your work, to make sure you are using the most efficient motor drive. He'll also tell you what's new about a lot of things electrical . . . and suggest ways in which you can "revitalize" or replace equipment which is now obsolete or inefficient.

"Job-fitted" motor drives are just one example of the completeness of the service he has to offer. Westinghouse also offers *all* types of motors, control and gearmotors to "revitalize" your plant from A to Z. These are only a few of the hundreds of items he can supply to help you "modernize electrically".

Why gamble on electrical equipment and motor drives that you know are doubtful? Check up now . . . revitalize . . . replace . . . with the help of your Westinghouse Distributor. J-90562

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Answer Manpower Problems with Higher Cutting Speeds

A practical way to compensate in part for the shortage of tool makers and machine operators is to increase the hourly output of each machine tool. This can be done easily, safely and without loss of efficiency on lathes, planers, slotters, shapers, turret lathes and hand screw machines, by taking advantage of the extra capacity offered by the ARMSTRONG TOOL HOLDER System.

With the correct ARMSTRONG TOOL HOLDERS for each operation, speeds and feeds can be stepped-up far beyond those accepted as standard. The "Armstrong System" provides not only highly efficient tool holders for each operation that take standard high speed steel cutter bits, but ARMSTRONG *Carbide TOOL HOLDER* for use with ARMIDE *Carbide-Tipped* Cutter Bits and the new ARMSTRONG CA TOOL HOLDERS which are specially designed for the new (Cast Alloy) ARMALOY Cutters. Both ARMIDE and ARMALOY Cutters increase the length of intervals between re-grindings from 10 to 100 times, and simplify the high speed machining of tough alloy steels, sand-filled castings and "hard-to-machine" metals and materials.

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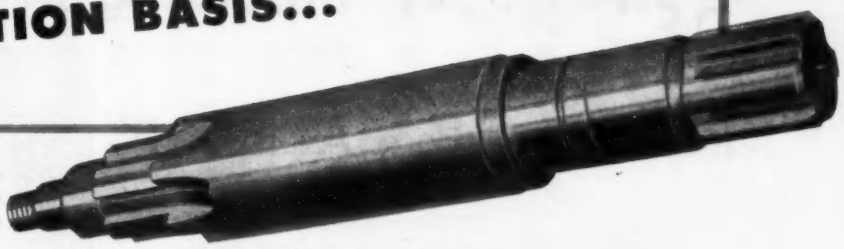
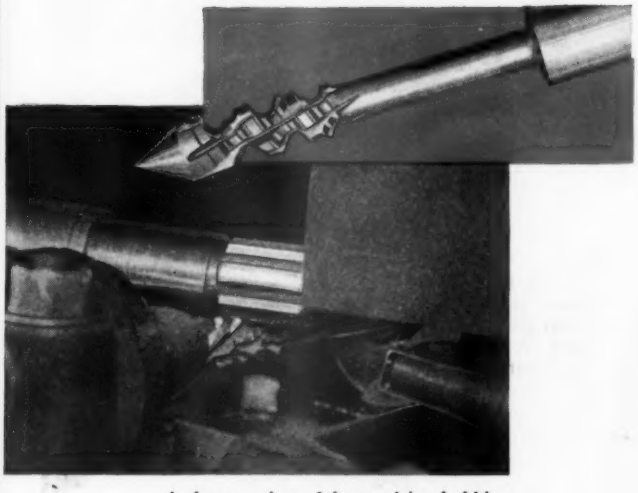
ARMSTRONG TOOL HOLDERS Are Used In Over 96% of the Machine Shops and Tool Rooms

HOBBING SPLINE KEYS TO .0003" ON A PRODUCTION BASIS...



High precision Stainless Steel shaft on which the splined keys are hobbed in one cut to +.0003"/−0000".

WITH BARBER-COLMAN HOBS AND HOBBING MACHINES



A close-up view of the precision hobbing operation described here. Above, the special small-diameter Shank Hob used.

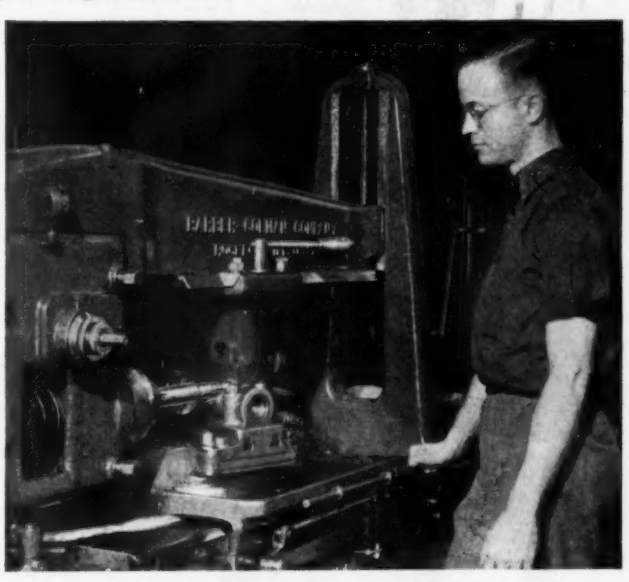
The endurance, and quality of performance, of many products depends on the ability of the maker to hold close tolerances in manufacturing. Barber-Colman engineering developments are keeping pace with today's — and tomorrow's — demands for accuracy.

KEY WIDTHS HELD WITHIN .0003" ALL KEYS MUST BE IDENTICAL

In the example shown here a Barber-Colman Shank Type Ground Spline Shaft Hob on a Barber-Colman Type "A" Hobbing Machine is delivering a high precision job in good production time. The six-key spline on the near end of this Stainless Steel Shaft (Brinell 202) is 1¼" long, with keys to be cut straight and parallel to width of .2805" +.0003/−.0000". No following bench operation is permitted. The job is accomplished in one cut with a hob speed of 204 r.p.m. and a feed per rev. of work of .0075", giving an average floor-to-floor time of 13 minutes per piece. The hob delivers 75 to 100 pieces per sharpening, and has an estimated total life of 3000 to 3500 lineal inches of cut.

MACHINES AND TOOLS MATCHED BY SKILLFUL ENGINEERING

In this instance it was necessary to design a special hob for the job because of the close limits and the interference of a shoulder when using conventional hobs. It was known that the machine would handle the tolerances if properly tooled and set up. So, with the addition of suitable collet and shank type hob spindle, the result was *a combination of cutting tool and machine* which performed satisfactorily, completing a difficult operation in one cut. Previously, an additional bench operation was necessary to hold required limits and finish. Barber-Colman products will be found *dependable* in performance and *accurate* to a high degree on your production problems also. Let us estimate *your* requirements.



A standard Barber-Colman Type "A" Hobbing Machine turns out this accurate spline job in 13 minutes per piece, floor-to-floor time.

BARBER-COLMAN COMPANY

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

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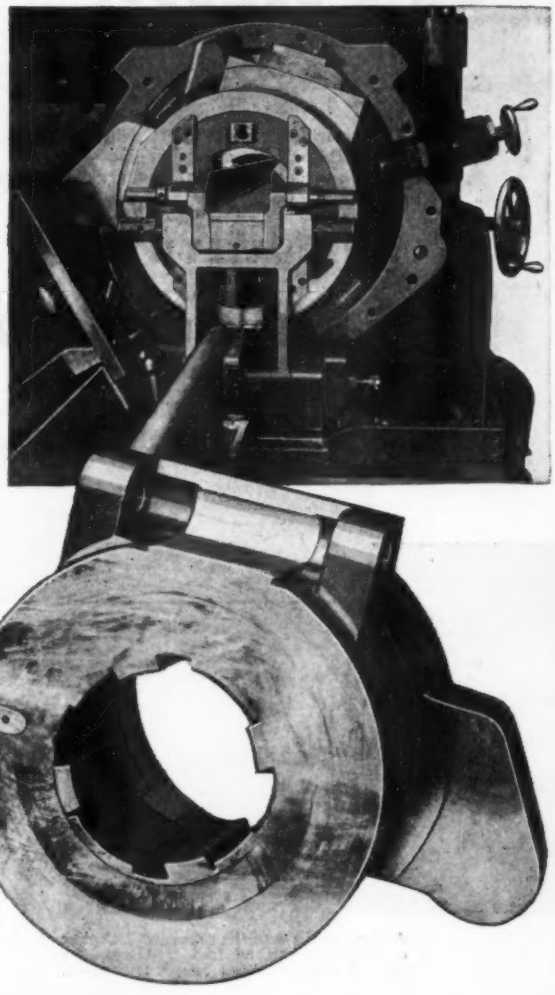
"KEEP UP THE BARRAGE"

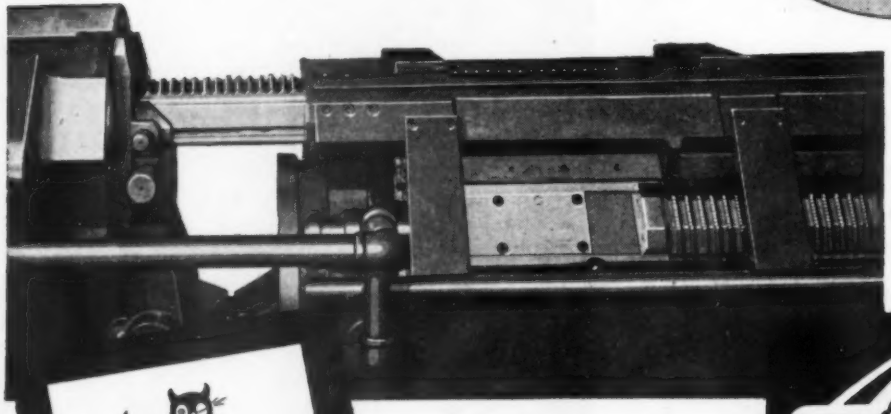
Speed — speed in production — is a prime factor in the manufacture of big guns to keep our far-flung battlefronts ablaze. "More guns in a hurry" has been a constant demand from all parts of the world.

A high rate of production—plus fine finish and absolute accuracy—has been attained by *American* engineers in designing equipment for broaching lock step slots in 8″ howitzer breech rings. The setup makes use of two *American* H-60-72 horizontal broaching machines and eleven different broaches to accomplish this task.

Whether your production requires fast output, excellent finish, or accuracy to close tolerances, whether it involves the use of standard or special machinery, let *American* engineers recommend the correct broaching equipment to do the job. *American's* complete broaching service—machines, tools, and engineering—is at your disposal. Write for details today.



Slots in breech rings for 8″ howitzers are broached on two *American* H-60-72 broaching machines, identical except for various broaches required for this operation. Top photo shows fixture which indexes the part one-quarter turn after each cut. Lower photo is of the finished part.



Above: American H-60-72 broaching machine, used in broaching lock step slots in 8″ howitzer breech rings. Turret holds five broaches and revolves after each four cuts to bring next broach in position for cutting. A similar set-up with six-broach revolving turret is used for completing the part.

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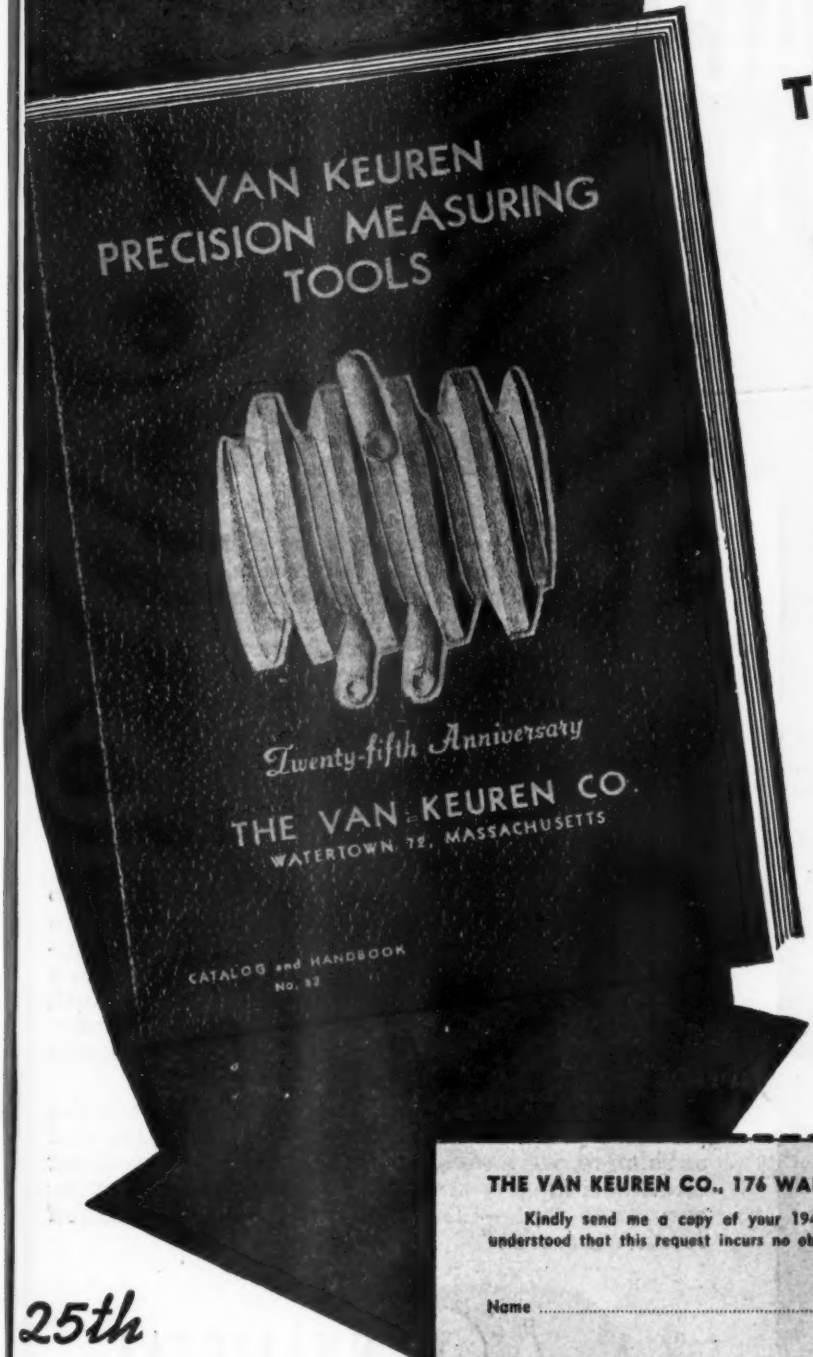

The NEW *Van Keuren* CATALOG and HANDBOOK No. 33

This new, revised Technical Catalog and Handbook contains 160 pages of practical, useful information in ready reference form on precision measuring. It describes, by text and illustration, various accepted methods and equipment for checking accuracy to hundred thousandths and millionths of an inch.

Through the use of the Van Keuren equipment described in this handbook, many outstanding improvements in production and product quality have been attained, and closer tolerances more easily achieved.

PARTIAL LIST OF CONTENTS

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New Light Wave Equipment with fused quartz optical flats.
New Laboratory Type Monochromatic Light.
New Solid Square Master Blocks having permanent accuracy.
New and complete Gear Measuring Tables from 5 to 500 teeth.

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How to measure standard and special screw threads.
Screw Thread data including tables of basic diameters and tap drill sizes for all American threads.
Thread proportions for American and Foreign threads.
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How to measure angles.
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THE *Van Keuren* COMPANY

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The All-American Carbide

When you purchase and pay for Kennametal, *our proprietorship in it ends.* It is yours, to do with as you wish. You may use this tough, hard cemented carbide as the keen, durable cutting edge of economy-promoting tools, or insert it at critical points of a machine to minimize the effect of abrasive wear—*without entering into complicated agreements.*

If the use of Kennametal helps you perfect an invention—*the rights to that invention, insofar as we are concerned, are completely yours.* If the invention is patentable, we neither ask, nor want, an interest in your patent merely because Kennametal is a key component.

We have encouraged, and will continue to encourage, uninhibited use of Kennametal. The products shown on this page illustrate a few typical applications. The resourcefulness of America's designers and inventors will constantly bring forth new devices in which the incorporation of Kennametal is indispensable to provide wear-resistance up to 100 times that of steel.

To these creative people, in whose minds the material progress of society first takes form and substance, we extend the fullest cooperation of our engineering and metallurgical staffs, and the reassurance that—*"There are no strings attached to Kennametal."*

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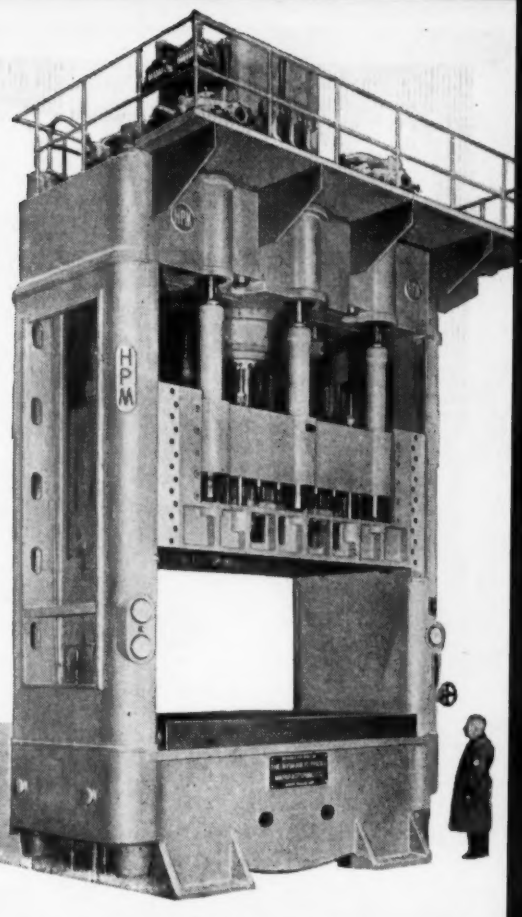
KENNAMETAL *Inc.*, LATROBE, PA.

DRAW THOSE BIG JOBS HYDRAULICALLY!



The H-P-M "All-Hydraulic" double-action press offers many advantages in the deep drawing of large sheet metal parts. The speed of the draw punch is under absolute control. A fast ram advance, with automatic slow-down prior to die contact minimizes the possibility of rupturing the metal at the start of the draw. Main slide, blankholder and die cushion pressures can be easily and independently adjusted. When drawing irregular shapes, blankholder pressure is adjustable at each blankholder ram, allowing the metal to slip more freely at certain points than others. Automatic reversal of the press at a predetermined pressure guarantees uniform results and protects both dies and press.

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Installed in a plant in England, this 750-ton H-P-M double-action press draws massive airplane fuselage sections. Press is equipped with a 400-ton hydraulic blankholder and a 133-ton hydraulic die cushion. Pressing surfaces are 144" x 84". Complete press is illustrated above.

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FOR DEEP DRAWING SHEET METAL

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RIVETT DRAW-IN COLLETS are available in all standard styles for bench lathe, engine lathe, miller and grinder use. Work held in a RIVETT COLLET is guaranteed to run "dead true" at the collet mouth and within .002" two inches from the collet mouth. For complete information on all RIVETT COLLETS and their adaptation to existing machines write for Bulletin 100.

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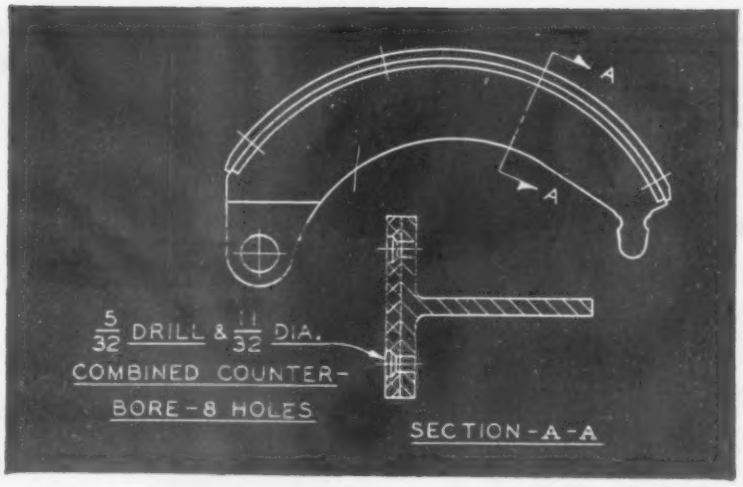
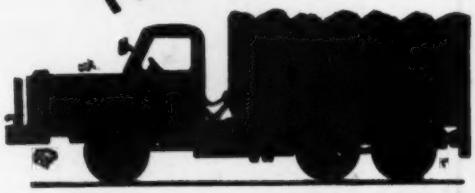


THIS IS A FLEXIMATIC



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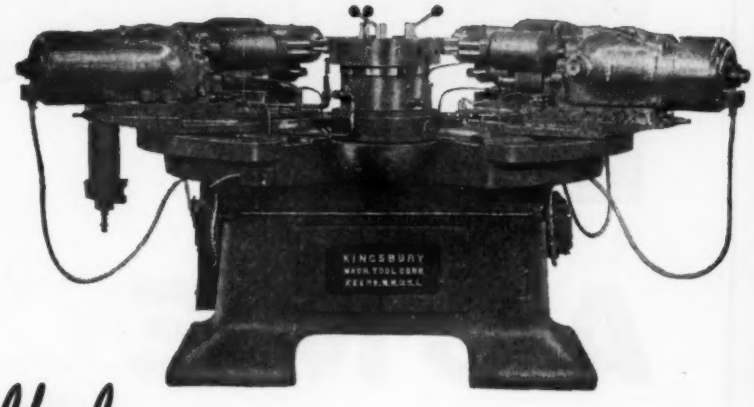
Brake Shoe and Lining Production Speedily and Accurately Handled



FLEXIMATIC

by KINGSBURY

One important advantage of the FLEXIMATIC is the fact that it is a machine providing automatic indexing for performing various machining operations in a single chucking of the work.

This method is specifically applied to the Model GD Eight-Spindle Fleximatic arranged for drilling and counterboring brake shoes and linings shown in the accompanying drawing. Many variations of the machine are available, some for lining only and others for shoes only.

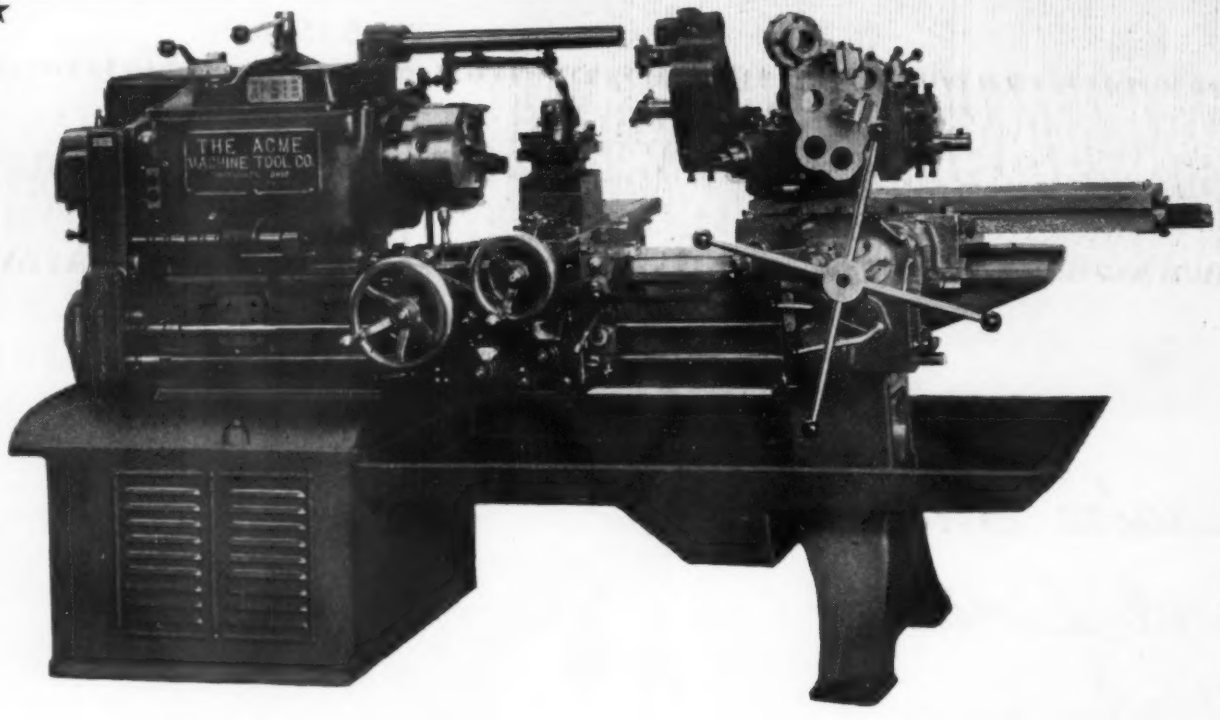
The FLEXIMATIC system pioneered by Kingsbury, involves a single base on which is mounted an indexing turret and standard metal cutting units for each operation such as drilling, reaming, counterboring, etc. The turret is designed to receive a number of duplicate work holding fixtures and can be rotated intermittently under control of the operator for presenting fixtures to loading and working stations. While units are in action, the turret is locked securely. All automatic operations are performed simultaneously while the operator removes a finished part and replaces it with a rough part at the loading station.

Speed, accuracy and easy handling even by unskilled operators are inherent in the performance of FLEXIMATICS.

Write today for illustrated Bulletin showing a number of different set-ups

KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U S A



ACME

Ram Type

TURRET LATHE

for Chucking Work

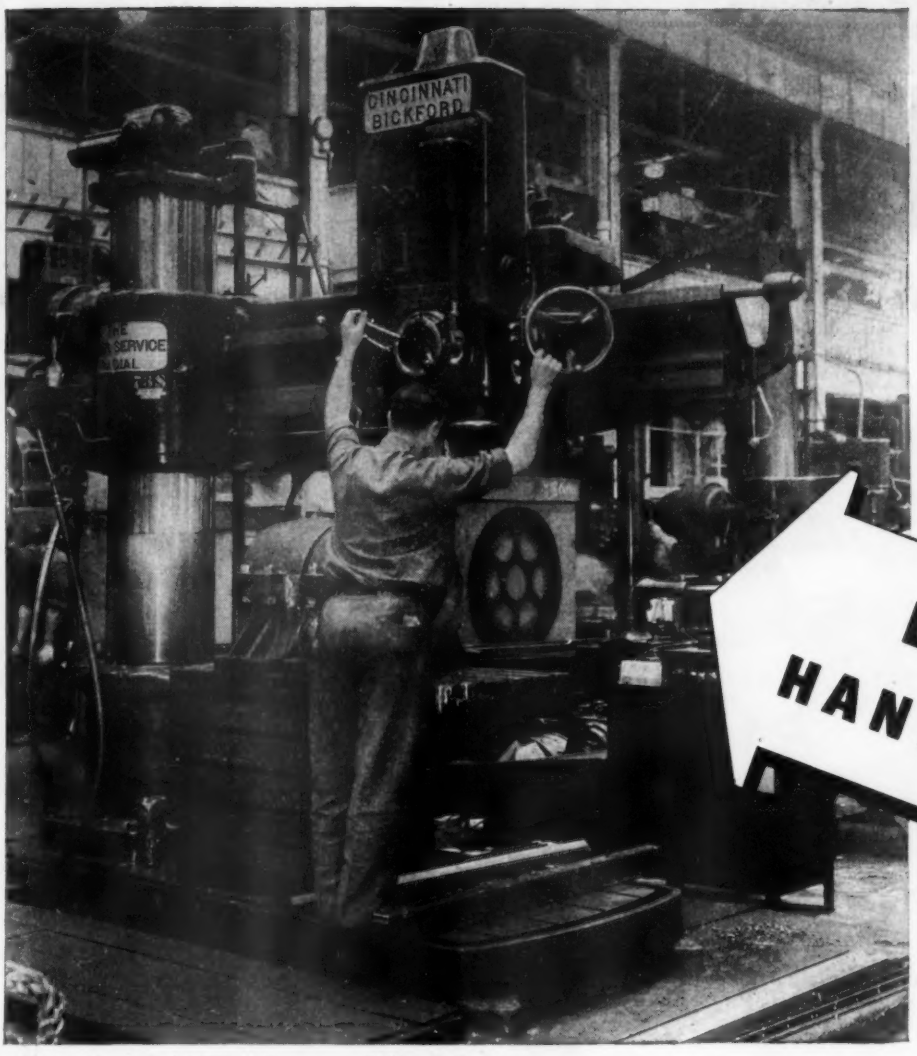
● Machine as illustrated shows the standard chasing attachment to cut from 4 to 32 threads per inch. This attachment is furnished as extra upon request.

Investigate the many features of this machine outlined below.

for accuracy—for speed—for low cost . . .

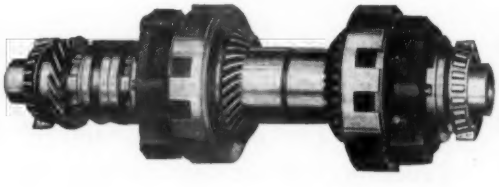
Hardened steel vees on bed.
Hardened steel ram slide bearings.
Automatic indexing and clamping of hexagon turret.
Triple roller bearing spindle.
Inverted dovetailed cross slide.
Twin nut back lash eliminator on cross screw.
Non-overhanding headstock.
Side carriage apron taper gibed to front bearing on bed.
Combination pump and splash headstock lubrication.
Conveniently located operating levers.
Wide range of independent feeds for either apron.

...The ACME MACHINE TOOL CO.
...CINCINNATI 32, OHIO.



EASY HANDLING

Photo: Courtesy of Elliott Company, Ridgway, Pa.



The Cincinnati Bickford Multiple Disc Driving Clutch has unusually large gripping surfaces. Running at a constant speed it transmits a maximum power at all spindle speeds. Proper proportions and advanced design give a quiet, smooth and trouble-free drive.

Equal Efficiency of Every Unit Makes the Balanced Machine.

Easy handling pays dividends in time and profits. The Elliott Company speaks of the easy handling of their Super Service Radial Drill — its power and its freedom from trouble. Cincinnati Bickford installations are profitable installations the world over.

Write for Bulletin R-24A or ask your neighbor.

See our condensed Catalog in Sweets Catalog Service.

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WHEN Pearl Harbor first shocked the country into action, "Put it on the Warner & Swaseys," was the battle cry of production men with urgent turning problems. Today, long, weary years later —years in which 3-shift days and 7-day weeks have tested men and machines to the utmost—it is significant to note that Warner & Swaseys are usually the last lathes to be laid off when a contract comes to a close.

Not only that! When the government-owned equipment in a plant is declared surplus, it's usually the Warner & Swaseys that are snapped up first by production-wise managements.

Why? The answer is simple! In the grueling, all-out test of machine tools, these Warner & Swasey machines simply stood up better, produced faster, gave less trouble.

When you plan your next equipment change, remember these war-proved facts. Let a Warner & Swasey Field Engineer help you choose the right Warner & Swasey war-tested turret lathes to boost your peacetime profits!

WARNER & SWASEY
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YOU CAN MACHINE IT BETTER, FASTER, FOR LESS... WITH A WARNER & SWASEY

TURRET LATHES, SADDLE AND RAM TYPES—CHUCKING AND BAR TOOLS—PRECISION TAPPING AND THREADING MACHINE

Mr. Krug Charts the Way

CHAIRMAN KRUG of the War Production Board set forth sound sense in his recent report on the needs and methods of reconversion.

He charts the way, in fact, toward the reestablishment of our peacetime economy with the least delay.

One could safely guess that there is hardly a manufacturer in the country who does not possess ambitious postwar plans—for new products, new materials or new techniques of doing things.

As soon as he is relieved of his wartime job or has part of his time and capacity at liberty to devote to a civilian program, he will require only a green light from Washington to proceed rapidly. The competitive urge alone will do the rest.

But his greatest fear is that ponderous bureaucracy on the Potomac will stymie his reconversion plans. Government will want to take on the beneficent role of the Great White Father to the country's economy. The individual manufacturer will be strangled with red tape, his initiative choked, his hands bound by myriad controls and regulations.

Mr. Krug's report serves to allay those fears. Controls are not going to be taken off completely, because the fight ahead in the Pacific rules out such action. But they will be lifted as soon as conditions permit; and some of them are being modified or removed even now.

The WPB chairman even went so far as to sound a warning against those who would redesign existing controls "for purposes for which they are not intended."

The truth is that industry will move fast when given its head. It wants more than anything else to proceed with postwar plans on a basis of a minimum of government controls in a free, competitive economy.

Manufacturers are prepared to take chances with new developments, risking large amounts of capital if they feel that they are operating in a reasonably friendly environment. They want to sell goods, keep people employed and make money. They see an opportunity to do all three in the immediate postwar years.

The speed with which they can resume nonwar activities will be greater than many of us realize. Therein lies a danger—that Washington, in its heavy-handed way, may overlook the capacity of industry and business to adapt itself quickly to changed conditions and to utilize without delay the resources released from war production.

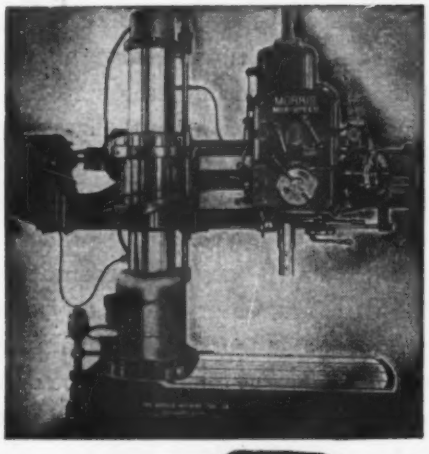
Mr. Krug sees great merit in an "every-man-for-himself" policy regarding manpower and materials; and he is right. If an attempt were made to get everybody off to an even start, the rules and regulations would get in the way of reconversion and retard rather than speed it.

No better statement than Mr. Krug's has been made of the necessity for getting rid of regulations and production limitations as quickly as possible.

"They automatically put ceilings," he said, "on initiative, imagination and resourcefulness—the very qualities the country will need most if we are to have a resilient and rapidly expanding economy after the defeat of Japan."

Burnham Finney

MORRIS
MOR-SPEED *Five Way* HORIZONTAL MACHINE



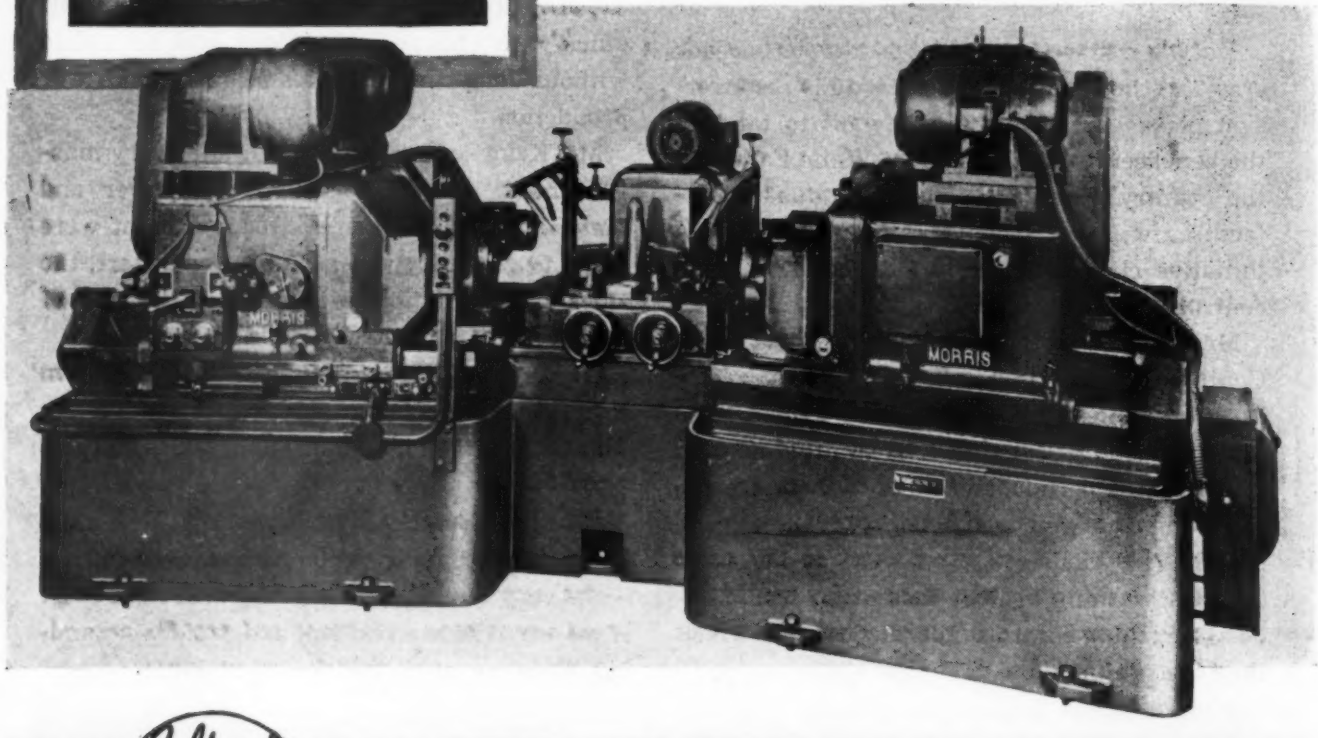
★ To keep pace with our airplane requirements it has been found that modern equipment capable of high production is a big help in this direction.

Illustrated is a Morris Mor-Speed Five Way Horizontal Machine used for rough and finish boring and facing operations on airplane parts.

The machine is equipped with a stationary fixture—four 10 H. P. and one 5 H. P. hydraulic units and nine spindles. It also has electric push buttons for operating the electric control mechanism.

Consult Morris on your high production precision work requiring modern equipment. They have the engineering staff—facilities—and experience to design and develop this type of equipment.

Send blue prints of your job for estimates



Builders of MOR-SPEED *Radials*

The MORRIS *Machine Tool Co.*

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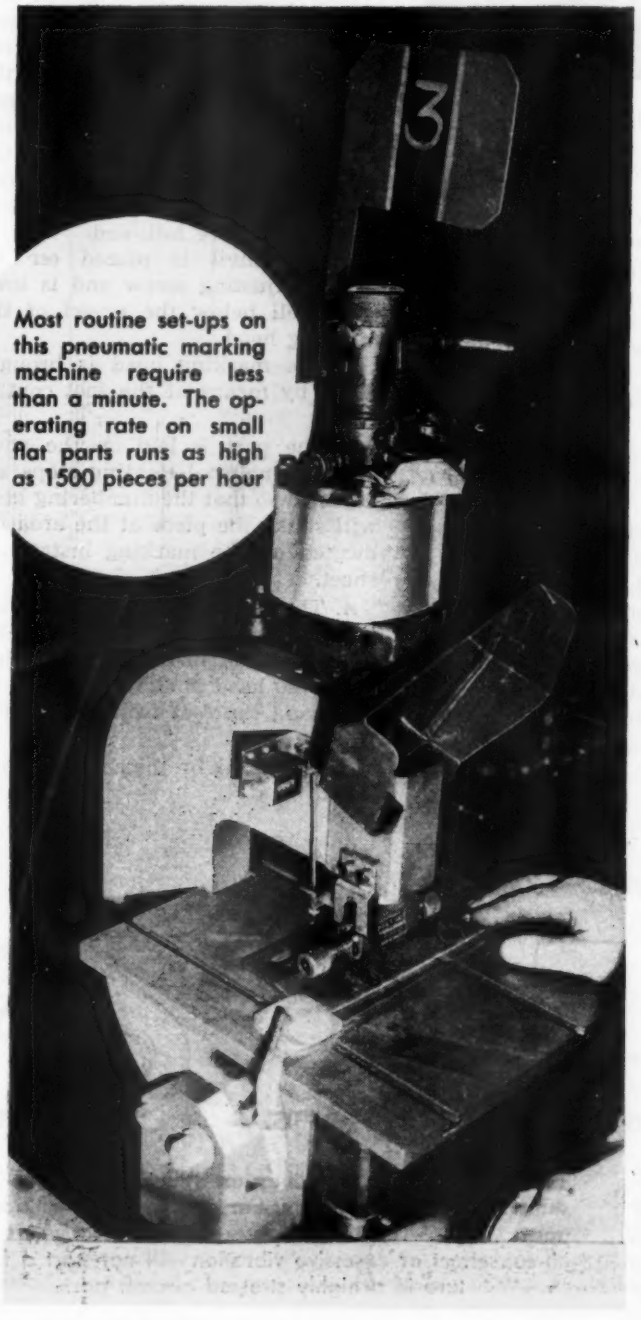
Thin Stock Accurately Marked By High-Speed Equipment



Most routine set-ups on this pneumatic marking machine require less than a minute. The operating rate on small flat parts runs as high as 1500 pieces per hour

BY DONALD D. MORTON
INDUSTRIAL ENGINEERING DEPARTMENT,
LINDEN PLANT EASTERN AIRCRAFT DIVISION,
GENERAL MOTORS CORPORATION

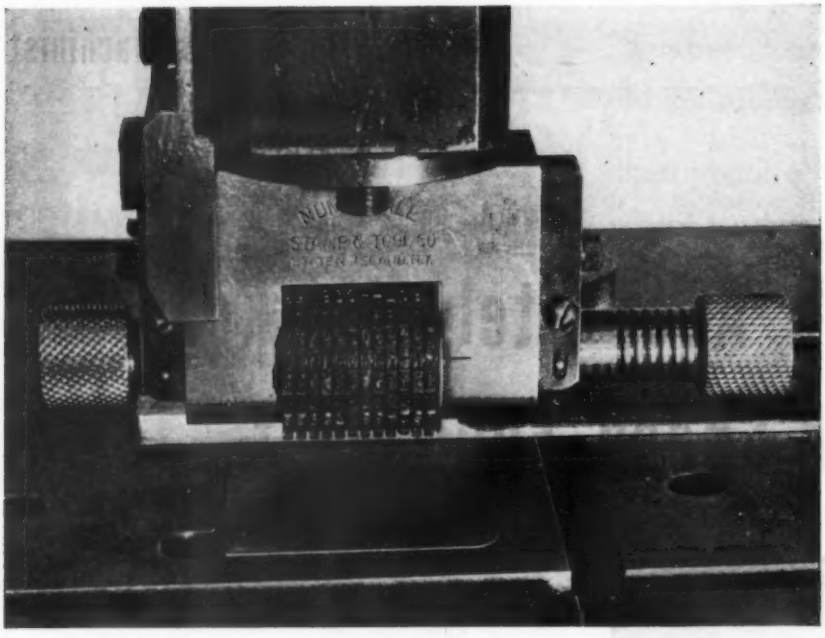
Part numbers are steel stamped to close tolerances for depth by an air-operated machine, which requires only two simple adjustments when a new set-up is needed

NAVY SPECIFICATIONS require that all aircraft components be suitably identified with part numbers, which are readable, permanent and do not interfere with the strength of the piece. Moreover, the aircraft manufacturer derives certain advantages from an adequate marking system, especially when the daily output amounts to several thousand stampings involving two or three score different items. For these reasons we undertook a production-research program looking toward the evolution of equipment and methods which would speedily handle a wide variety of work with a minimum amount of downtime for set-up purposes.

After machine marking several million pieces by the steel stamping process, we find that average production per operator amounts to approximately 5000 parts per eight-hour shift. That rate is boosted to approximately 1500 pieces per hour when the pieces are small and air ejection can be used.

Besides speed, the advantages of the steel stamping process are:

1. The method is permanent, as compared to rubber stamping with ink. Steel-stamped numbers carry through future finishing operations such as burring, tumbling, anodizing, heat-treating and painting. Parts produced by routing are marked after stack drilling and before burring. Purchased blanks are marked before heat-treatment or forming. Parts blanked in punch presses are marked after tumble burring, since the tumbling process work-hardens the surface of the material and tends to destroy a previously applied



Numbering wheels are engraved to an accurate diameter with respect to the axis of rotation, one factor which is important in accurate control of the depth of marking on aircraft parts

part number. Extrusions are marked after cutting to length. These marking operations are in all cases governed by marking instruction sheets prepared by the Industrial Engineering Department to indicate when, where and how each piece must be numbered.

2. The marking of parts as early as possible in the manufacturing sequence enables production operators and salvage workers to identify parts quickly. To the eye many parts are alike and gaging would be required to determine the identity of unmarked parts. If parts become mixed, it is cheaper to scrap unmarked parts than to spend the time to unscramble them despite the cost of producing these parts.

3. Field service men are able quickly to identify damaged parts which require replacement, thereby helping to keep planes in action.

Various commercial numbering machines are available, but we decided to design our own equipment in order to attain certain characteristics:

1. Accurate control of numbering-head impact to give the required depth of mark.

2. Quick resetting of numbering head because of small-lot sizes.

3. Numbering wheels with characters of uniform height with respect to the axis of rotation.

4. Several types of work anvils incorporating material-locating stops.

5. Tiltable construction of machine for easy feeding and discharge of parts.

6. Automatic air ejection of small parts from table.

7. Quick height adjustment of anvil to suit material thickness.

The machine that was designed and placed in service can be set up in less than one minute and it will give the required width of mark to ±0.002 in.

Accurate control of the depth of marking is achieved by the use of a pneumatic power head, in this case a Thor Model PSR-1 standard squeeze riveter without yoke. To the ram there is attached a Number-all Model 82 selective numbering head having 12 numbering wheels. The force exerted by the numbering head upon the work is proportional to the air pressure admitted to the cylinder, assuming the height adjustment of the anvil to be constant. Therefore the marking machine incorporates means for adjusting the anvil to suit the material thickness.

A height-adjusting screw having a locknut and handle is fitted to the lower portion of the machine yoke, or frame. At each set-up the following steps are followed:

1. The anvil is placed on the height-adjusting screw and is lowered well below the travel of the marking head.

2. The marking head is brought down by means of the foot control valve.

3. The part is laid on the anvil and the material-locating stops are adjusted so that the numbering head will strike the piece at the area indicated on the marking instruction sheet.

4. The anvil is raised until the piece is firmly in contact with the marking head in its down position. Then the head is allowed to rise by removing the foot from the control pedal.

5. The crank on the height adjust-

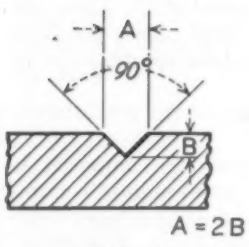


FIG. 1

FIG. 2

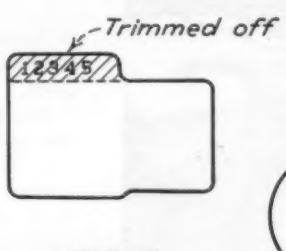


FIG. 3

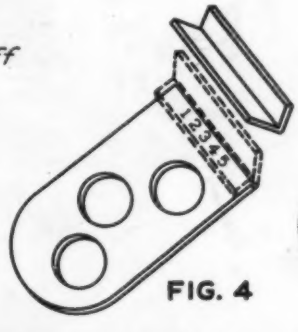


FIG. 4

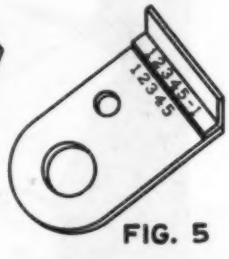
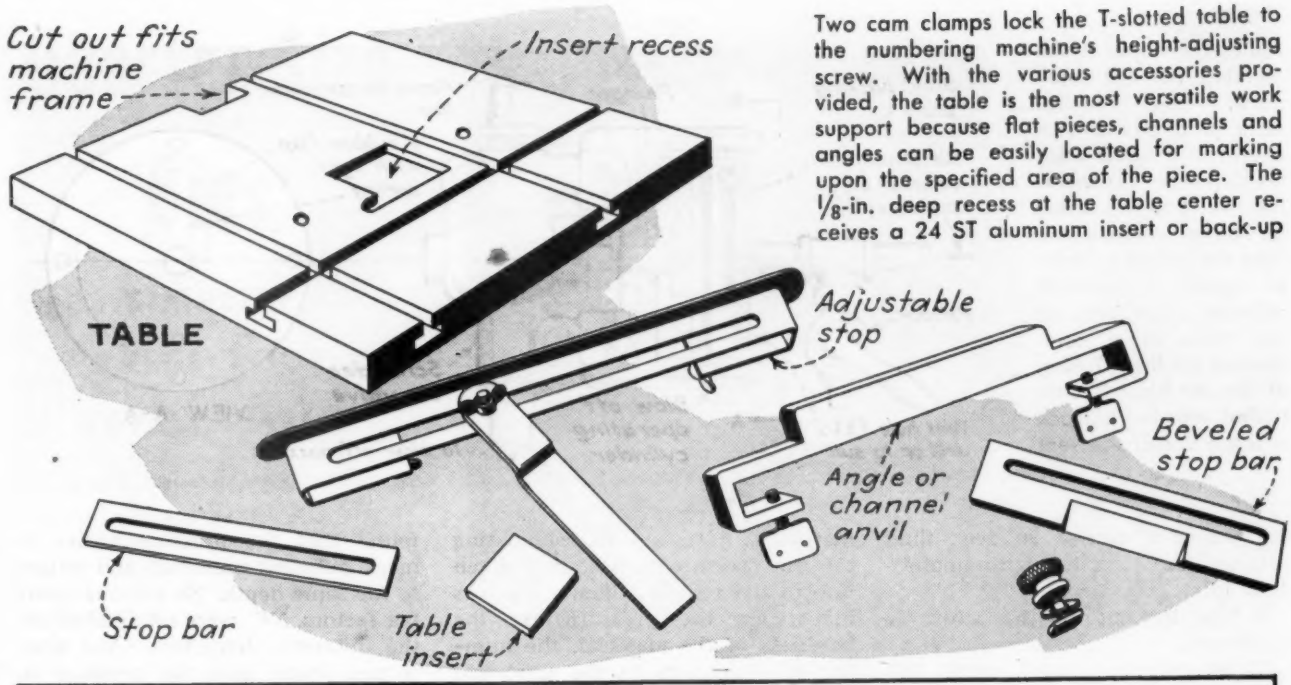
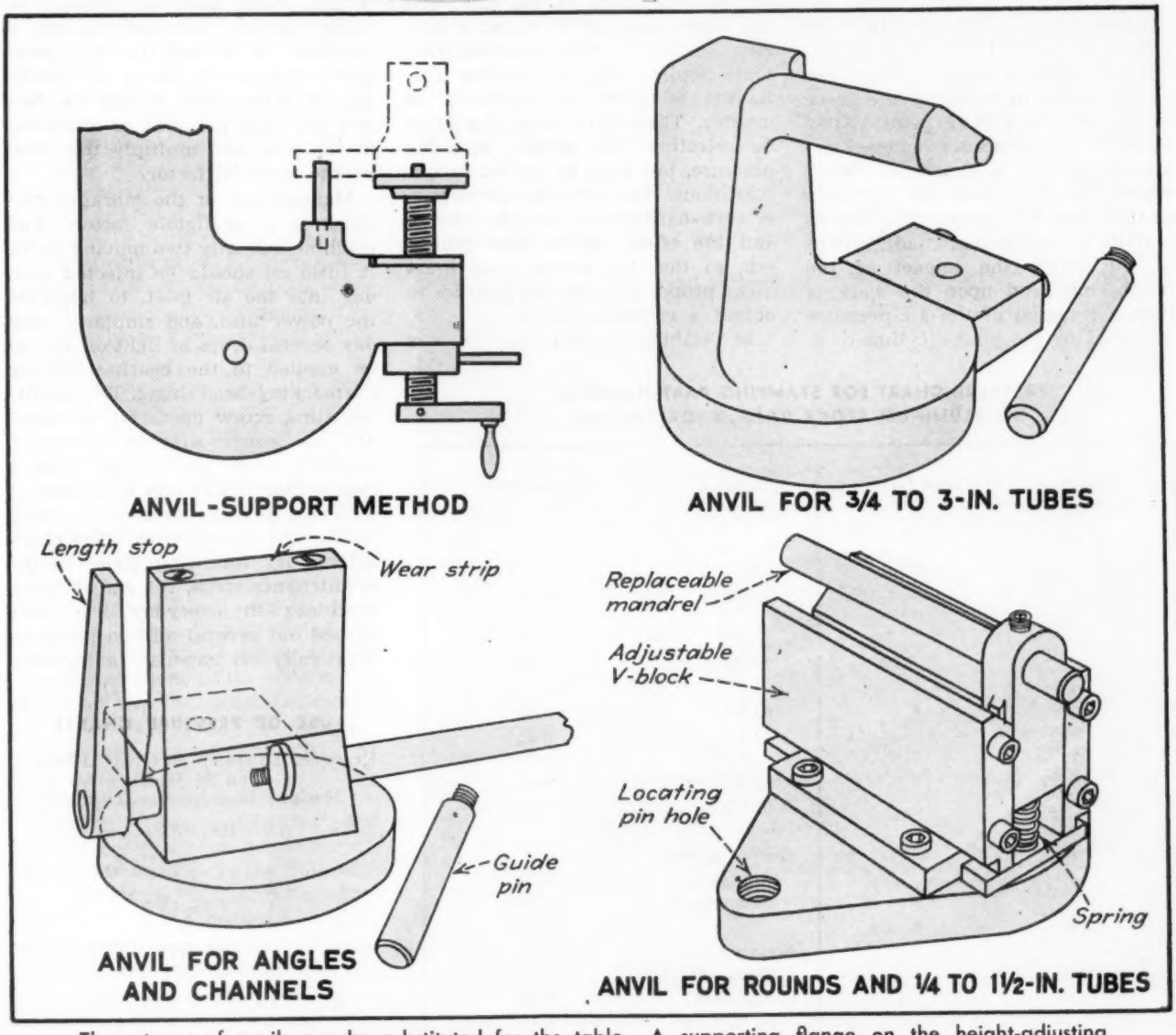


FIG. 5

Requirements in Marking: Fig. 1—A depth of 0.002-0.005 in. is adequate, for steels and aluminum, and 0.002 in. is sufficient for aluminum under 0.040 in. thick. Fig. 2—The mark must not fall on a future formed bend, to avoid starting a crack. Fig. 3—The mark must be clear of subsequent cuts, sandings or drilled holes. Fig. 4—After assembly the part number must be clear of added parts. Fig. 5—Locate the part on a surface where an oil-can effect or excessive vibration will not start a fracture in a highly stressed aircraft part

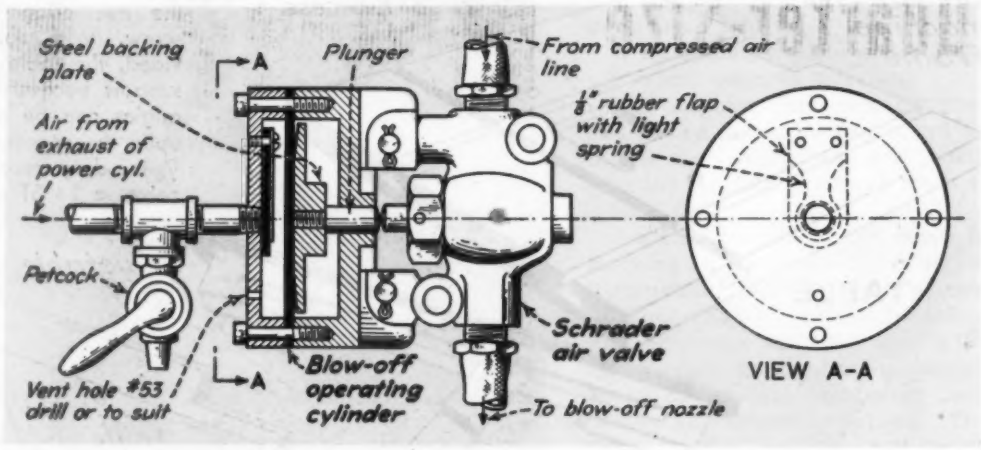


Two cam clamps lock the T-slotted table to the numbering machine's height-adjusting screw. With the various accessories provided, the table is the most versatile work support because flat pieces, channels and angles can be easily located for marking upon the specified area of the piece. The 1/8-in. deep recess at the table center receives a 24 ST aluminum insert or back-up



Three types of anvils can be substituted for the table. A supporting flange on the height-adjusting screw is provided with a dowel pin that fits a hole in the center of the anvil base, and a guide pin screwed in the anvil-base extension enters a hole in the boss on the numbering-machine frame

Air ejection speeds the marking rate of small parts. Chief requirement is a device that operates in timed relationship with the marking ram, and this is met by using exhaust air from the power cylinder to control a blow-off cylinder which trips an air valve in a compressed air line. Timing of the air blast is controlled with the petcock and the size of the vent



ing screw is turned 90 deg., thus raising the anvil approximately 1/16 in.

6. The locknut on the screw is tightened.

When marking small parts, the machine frame is tilted so that the pieces can be slid into position under the marking head. Guides and a stop assist in bringing the piece to rest at the proper point. After marking, the pieces are removed automatically by a timed air blast, which lifts them over the rear stop so that they will drop into a basket.

With a standardized adjustment of the anvil, the impact of the numbering head upon the work is then a function of the air pressure admitted to the power cylinder. A method is necessary for calculating the air pressure to stamp a given line to the required depth. Factors influencing the pressure are the hardness of the material. the number of characters to the line, and the force required to indent a specific character. The accompanying table applies only to marking aluminum of 0.040 in. thickness or greater. These data serve as a guide to selecting the proper marking pressure, but must be varied to suit conditions. For example, aluminum is work-hardened by tumble burring and the effect varies from job to job, so that the set-up man must make proper adjustments in order to obtain a readable mark.

In establishing this chart, it was found that the pressure varies to mark different numerals and letters to the same depth. So various number factors, NF_1 were established for the different characters. And also, it was found that the pressure to mark various materials is not a constant. So to find the total pressure required to mark a specific line, it is necessary to add the factors for each numeral or character in the line, and multiply this total by the material factor.

Maintenance of the marking machine is a negligible factor. The machine has only two moving parts. A little oil should be injected each day into the air inlet, to lubricate the power unit, and similarly each day several drops of light oil should be applied to the bearing guiding the marking-head shank. The height-adjusting screw needs oil occasionally to assure ease of operation. Marking heads are cleaned with a typewritter brush and a solvent at intervals in order to avoid building up foreign matter within the characters. By following these simple maintenance steps, the six or seven machines in everyday use have turned out several million pieces at practically no expense for repairs.

PRESSURE CHART FOR STAMPING PART NUMBERS ON ALUMINUM STOCK 0.040 IN. OR THICKER

Character	Factor NF_1	Material	Factor MF_2
1	3	Aluminum	
2	4	3S ½ H	0.59
		17 ST	1.26
3	4		
4	5	24 SO	0.86
		24 ST	1.80
5	5		
6	6	52 SO	0.63
		52 S ¼ H	0.83
7	3		
8	7	52 S ½ H	0.89
		61 ST	1.10
9	6		
0	5	Chr.-Moly Steel	
		Annealed	1.29
—	1	Normalized	1.58
L/R	4		
		Stainless Steel	
x	4	Dead soft	1.42
		Annealed	1.45
		¼ H	2.14

These pressures are based upon a line width of 0.008 in. ± 0.002 in.

USE OF PRESSURE CHARTS

Example: To stamp part No. 11300-1 R on 3S ½ H

Machine Pressure $P = NF_1 \times MF_2$

No.	NF_1	$MF_2 = 0.59$
1	3	$P = 28 \times 0.59$
1	3	
3	4	$= 16.5$
0	5	
0	5	Use approximately 17 lb.
–	1	air pressure
1	3	
R	4	
Total	28	

For aluminum under 0.040 in. use one-half the calculated pressure.

Quarter-Size Dies

SIMPLIFY PRESS TOOL DEVELOPMENT

BY JOHN A. COLE, TOOLING DIVISION
DOUGLAS AIRCRAFT COMPANY

METAL DIES made either of steel or Kirksite A alloy are being used to an increasing extent in the aircraft industry for drawing and forming large sheet-metal parts. Examples are the manufacture of stainless-steel firewalls and large aluminum-alloy parts. Because of the irregular contours of many of these stampings, the development of the blank and die shapes often requires considerable time, particularly when done full size. Through the practice of making quarter-size dies for try-out purposes, the Santa Monica plant of the Douglas Aircraft Company often saves several weeks in getting into production of large stampings.

The quarter-size dies are cast from Kirksite A alloy. They are set up on small double-acting hydraulic presses, and the blanks are made proportionately thinner than the full-size blank in most instances. But satisfactory results have been obtained with full-thickness blanks.

For many blanks, a truncated cone with welded seams is used in order to obtain proper distribution of the metal and to reduce wrinkles and cracks. The shape of the cone is obtained by drawing sample blanks in the quarter-size die. This practice also permits inexpensive study of weld positions, to avoid their location at points where the metal is considerably stretched. After the blank shape and seam positions are determined, notches or pin holes are put in the blank to guarantee proper location during drawing.

When the drawing and forming problems have been solved with the quarter-size die, a full-size die can be made with assurance that little reworking will be necessary. Then full production of the required part gets underway with minimum delay.

Quarter-size dies of Kirksite A alloy are mounted in a small double-acting hydraulic press to study drawing and forming problems. In this case, the original blank was a truncated cone made by seam welding

Delays for reworking the full-size dies to produce parts free of cracks and wrinkles are minimized by the preliminary study of the drawing and forming problems involved by means of quarter-size tooling

Lens Inspection Stepped Up With a Compact Instrument

BY WILLIAM S. MAZAR AND WALTER WALLIN,
LINK AVIATION DEVICES, INC.

Instead of fussy manipulation of a lens bench, the inspector merely lays the test piece on a guide and turns an eyepiece located at a convenient height

IN COMMON with other instruments manufacturers, we found that war-production schedules could not be met with ordinary methods of lens inspection. Ordinarily, when plano-convex lens are made in small quantities, the focal length is checked on a lens-bench set-up, in which a microscope is successively focused upon the image of a collimated slit placed at various distances from the lens. From the standpoints of output and simplicity this method is unsatisfactory for these reasons:

1. At low magnification, the depth of focus of the lens in manufacture was too great for an accurate check.
2. At high magnification, aberrations of the uncorrected test lens or part might be of such an order that no sharp focus could be obtained.
3. The set-up was complicated and fussy in character, requiring a highly skilled operator and constant check of equipment accuracy.
4. Output was too low for the quantities involved in war contracts.

These objections were overcome and a 600 percent increase in production secured by designing an inspection instrument that employs the principle of the "Focometer." In this device, the test lens is laid upon a guide, or positioning piece, and an optical system causes collimated light to pass through the test lens and then to a focusing telescope which detects departures from parallelism of light rays incident upon it. Furthermore, because of the special target reticule, it is possible to eliminate inspection of the lens radius.

As shown in the accompanying drawing and photograph, the frame of the instrument is made of steel tubing, securely cross-braced and brazed. The lower horizontal tube contains an adjustable assembly consisting of light source, switch and target reticule. Light rays pass through the removable target reticule which consists of three parallel human hairs cemented between two ground-glass disks. This reticule produces an easily discernible and sharp pattern, covers the majority of the lens area and can be replaced with another style.

Light rays passing through the target reticule impinge upon a first surface mirror secured in the cap at the end of the lower tube and are bent 90 deg. to pass through the first collimating lens. Just above this there is a negative master lens, which is a plano-concave lens having a focal length exactly the negative of the focal length of the test lens. Hence refraction takes place at the interface between the positive and negative lens if the test lens varies from nominal refractive power. This system is of advantage when the power of the test lens is

A steel-tube frame, well braced, maintains proper alignment of the target-reticule tube at bottom and the eyepiece tube at the top. The instrument is self-contained, and is ready for use at a flick of the light switch

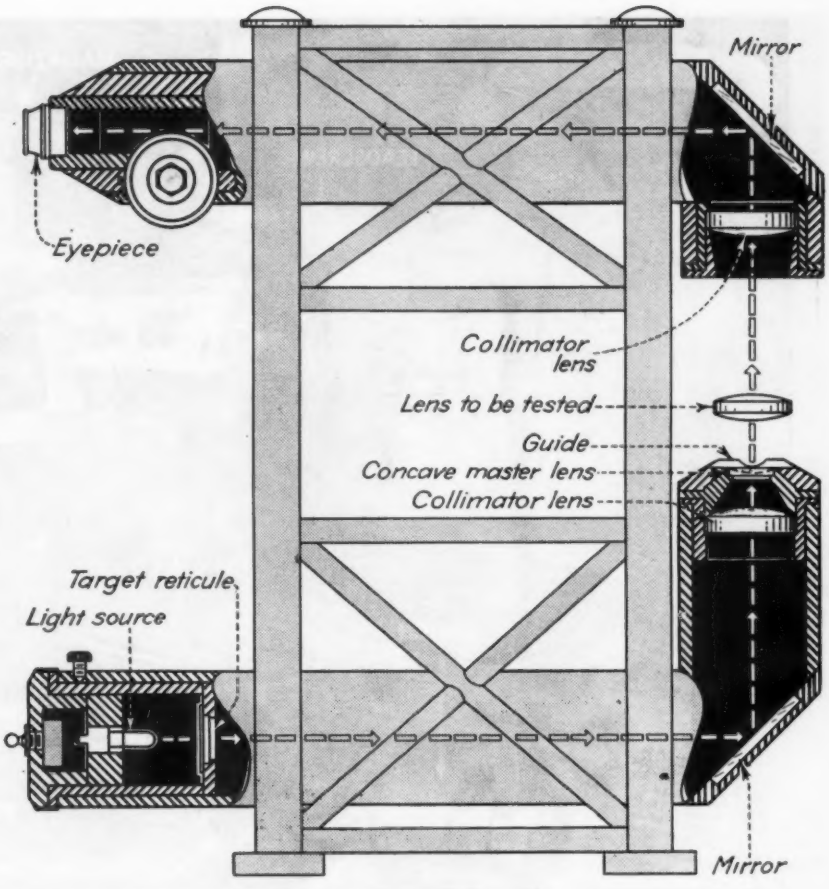
quite high—in this case, the test lens has a 6.100 in. focal length ±0.020 in.

By focusing the eyepiece, the instrument measures the variation from nominal refractive power of the test lens, which is a reciprocal of the focal length. The measurement is read from the graduated drum attached to the pinion that focuses the eyepiece.

The principle of this instrument may be used with equal success for lens that are not plano-convex, by selecting the curvature of the master lens so that the total power of the master and test lens is equal to zero. Any deviation therefrom is easily measured by the telescope.

The upper tube contains an eyepiece, which is inserted in a bushing actuated by a spring-compensated rack and pinion. The pinion is operated by a graduated, knurled drum, and a drum pointer is fixed to the instrument. A first-surface mirror located in the tube cap bends the light rays passing through the test lens another 90 deg. so that they form an image in the eyepiece, which incidentally is placed horizontally and at such a height that its use is convenient to the operator.

When not in use it is advisable to protect the master lens with a dust cap, and to remove dust or grit periodically with a camel's hair brush. Long life of the master lens can be expected only with adequate care.



Variations from nominal refractive power of the test lens are determined by placing it upon a master lens of exactly the negative focal length and viewing the eyepiece image of the target

Innovations in Sandblasting Operations

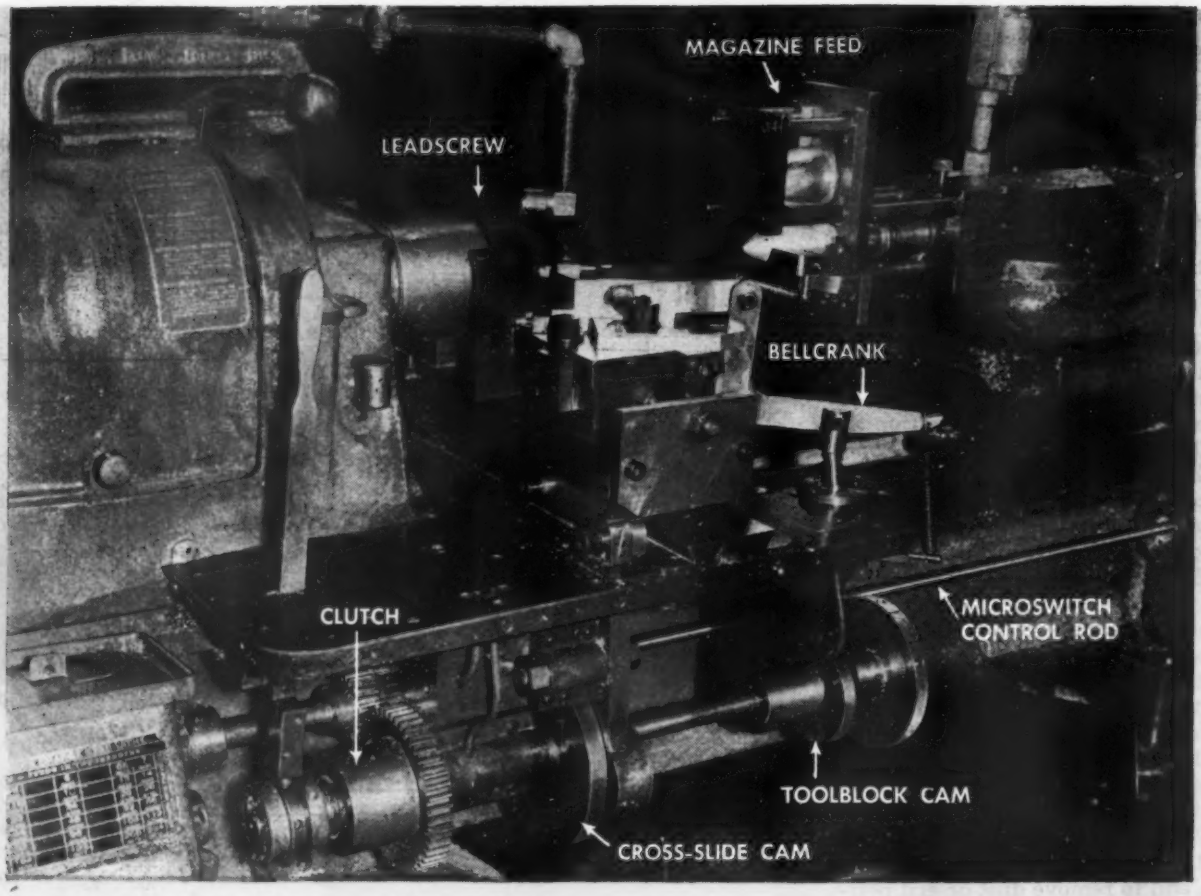
By JOHN E. HYLER

THE VARIOUS USES for which sandblasting is now employed has brought different abrasives for the purpose into the limelight. Silica sand is used in some places and cases, while in others, hard pure flint is employed. This material has sharp angular surfaces, which add greatly to its erosive ability. It is also much used in stone sawing operations. Steel shot and grit are also widely used in sandblasting operations, and are supplied by various manufacturers. A development that has far advanced the efficacy and efficiency of blasting operations with steel shot and grit is the fact that different manufacturers heat-treat this material, thus increasing its surface hardness greatly and improving its cutting qualities.

We ordinarily think of sandblasting abrasives as being used in connection with an air blast. While it is true that this is the usual method, we must not overlook the fact that in some cases, especially in the cleaning of castings coming from the foundry, centrifugal blasting is being practiced to considerable degree. A considerable number of highly efficient blasting machines have been designed and built for throwing these abrasives against the work to be cleaned by centrifugal action.

Where sandblasting is done by air, and where steel shot or grit is employed, it becomes important to keep the air at least reasonably dry. Unless some type of separator is used in the compressed air line, to take out any water and oil entrained, slugs of water will emerge at the point of operation, whether it be an ordinary blower, a paint spraying gun, a sandblaster, or what have you. This is because the air is naturally heated in process of compression, and heated air has an affinity for moisture. Contrariwise, cooling of the air as it passes through the lines, and as it expands at the point of use, tends to condense the water vapor and to let it emerge as droplets or slugs. The effect of moisture on steel grit, naturally, is to cause a given amount of corrosion and packing together. Happily, there are many different types of separators that can be applied on compressed air lines, to take out all water, before it reaches the point where the air emerges.

Sandblasting nozzles have shown improvement in resistance to abrasive wear. Progress has also been made in protecting decorative stencils from abrasive action.



Headstock end of lathe, in the foreground, with cover removed, showing the clutch and camshaft that controls all tool motions. A slender shaft, extending to the right, operates the Microswitch controlling the solenoid-operated air valves

Lathe Production Increased by Multiple-Operation Tooling

BY H. E. SHEPARD, FACTORY MANAGER, RUPERT DIECASTING COMPANY

FROM SATISFACTORY experience with die-cast noses and other parts for shell of small caliber, Navy Ordnance naturally turned to die-castings to meet the rapidly expanding requirements for 2¼-in. rocket body noses. To the Rupert Diecasting Company, already in quantity production of 20-mm. noses, the production of rocket nose castings presented no difficulty, in spite of the relatively thicker wall section involved. However, there was a problem of providing economical machining facilities that would keep pace with the casting machines.

The nature of the workpiece indicated several requirements. The nose casting, which is hollow and tapered, would have to be chucked without jaw clamping. It would also have to be chucked in such a manner as to leave no marks on the smooth cast surface, which was not machined. The problem was solved, and the work accomplished by converting engine lathes so that semi-automatic chucking could be used.

Faced with the need for greater machining output, tool engineers at Rupert Diecasting adapted a standard engine lathe so semi-automatic chucking could be used

Because of the relatively heavy wall section, 100 shots an hour was the fastest casting rate feasible with the three-cavity die, and a somewhat slower rate with the four-cavity die. This casting was done in machines equipped with hydraulically operated plungers that applied

Closeup of casting die, showing gate of four castings after it has been pushed out of the ejector half of the die, preceding removal by hand

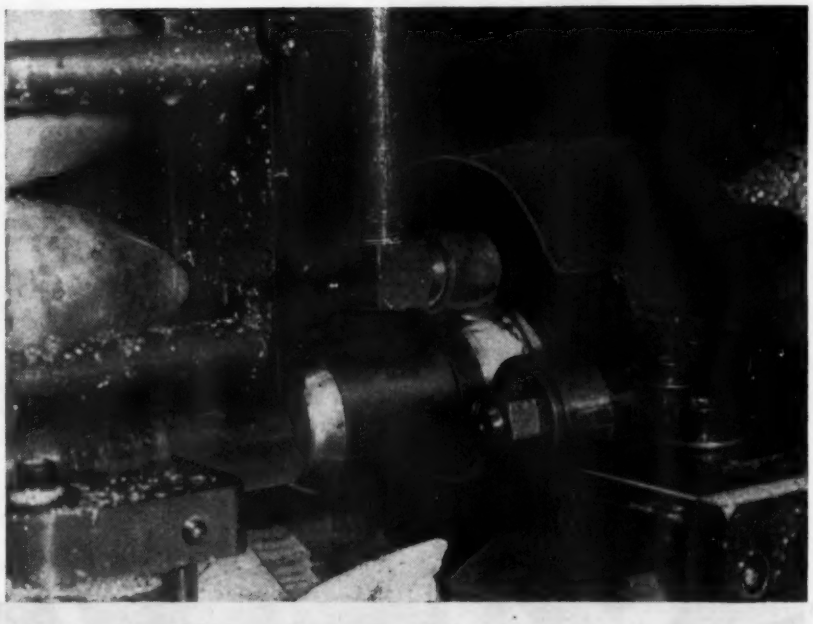
After quenching, gates of castings slide down a chute to press operator, at left, who inserts single castings into the trim die to shear off flash. Inspector at the right spins each casting in the ogive gage, and notes weight on scale as a check against porosity

a pressure of 2,500 psi. on the molten Zamak zinc alloy. The alloy is maintained at a temperature of 750 F. by automatic pyrometric control.

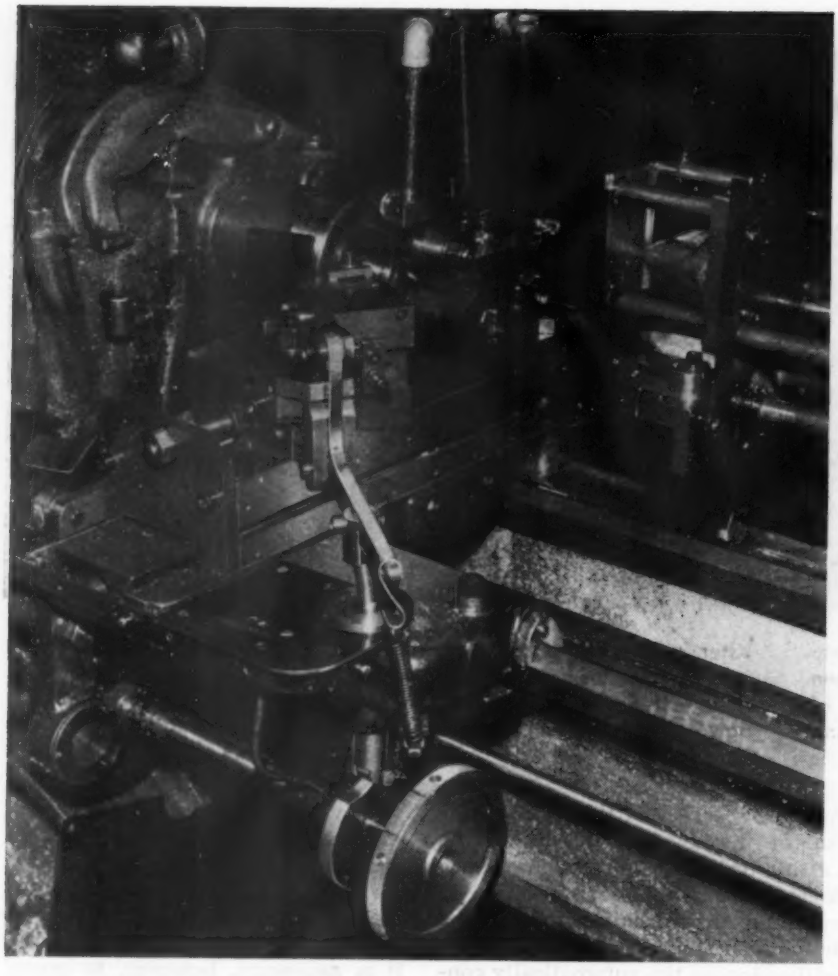
It was found that if the dies were opened before the castings were completely solidified, blisters would form or the castings would "blow-up." To prevent this, the dwell following the die filling is timed by a pilot light that is switched on at the instant the shot is made and is not shut off by the automatic time switch until the required number of seconds has elapsed. The die is then opened and as the die recedes the gate of castings is automatically pushed off the cores. It is lifted out by the operator, who quenches it in cold water. He then slides the gate to another worker who breaks off castings having visible defects and throws them into a tote box. The gate is shifted so that one casting at a time enters the trim die for shearing off the flash.

The next operator performs two inspection operations on each casting. In the first, each casting is set on a small platform scale to determine whether its weight is within required limits. This serves as a necessary check on porosity. Allowable variation must not exceed 0.1 lb. from the standard. In the second inspection, the casting is placed in an ogive gage and spun about its axis. If the casting is "blown up" or has blisters, it will not turn freely. Rejections because of this condition are rare, because of the precise timing of the dwell that follows the casting operation. Detection of such a condition is important because, on reaching the machine, the casting will not fit the chuck properly and will endanger the automatically controlled cutting tools. Scrap has been cut to about 3 percent. Accepted castings are set in truck trays and transferred to the lathes.

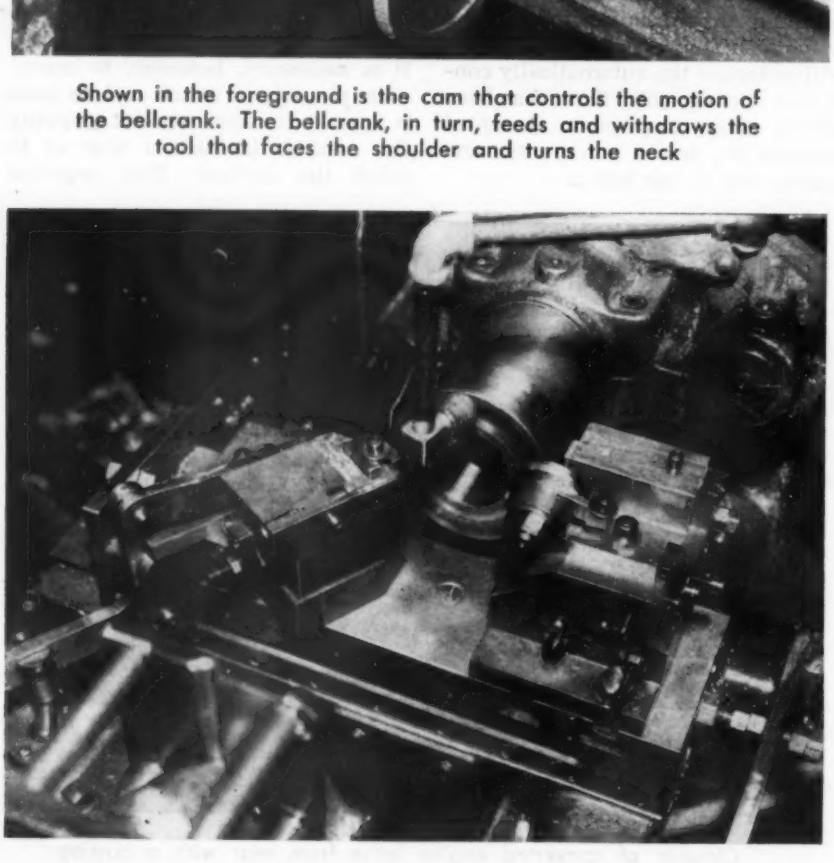
Only two machining operations are required because the tapered nose and thread diameter are cast to size and so smooth as to need no machining, and the central hole is cored within dimensional limits. It is necessary, however, to center each piece in a chuck and to hold it against turning, without gripping the castings in such a way as to mark the surface. This required



Closeup of converted engine lathe from rear with a casting pushed into the chuck by an air-operated ram, the shank of which is below the two castings shown at upper left



Shown in the foreground is the cam that controls the motion of the bellcrank. The bellcrank, in turn, feeds and withdraws the tool that faces the shoulder and turns the neck



Here is the chuck, unloaded, with leadscrew on its o.d., the circular threading tool on its slide and, at left, the bellcrank that feeds step-recessing and neck-turning tool

both a special chuck that fits the tapered nose, and means for pressing the piece into the chuck tightly enough to be driven by friction. This is accomplished by employing, in place of a tailstock, an air-operated ram which takes the casting from a hand-loaded magazine and forces it against a three-point seat in the chuck and holds it there while machining proceeds. The end of the ram, which is mounted on ball bearings, fits the base of the casting and turns with it. Tools are then fed in automatically and the coolant flow, similarly controlled, is shut off when machining is complete and the piece ready for ejection.

Automatic Operation Provided

The lathe is equipped with a special camshaft. This provides automatic operation, except for placing the castings in the magazine. The magazine holds two castings, the lower one falling into loading position as the plunger is withdrawn at the end of the machining sycle. The lathe spindle turns at 600 r.p.m. machining 200 castings an hour.

Operation cycle of the lathe is as follows:

1. A cam on the special camshaft rocks a longitudinal shaft placed at the front of the lathe, and a lever at the end of this shaft closes a Microswitch. In turn, the switch operates a solenoid valve that admits air to the injector ram cylinder. As the ram advances it picks up the lower of two castings and presses it firmly into the continuously rotating chuck, and at the same time compresses an axial ejector plunger.

2. A second cam slowly lifts one end of a bellcrank, which is pivoted on the fixed lathe carriage. Meanwhile the opposite end of the bellcrank advances a form tool horizontally at about a 30-deg. angle to the piece axis. This tool undercuts a shoulder on the face, or step, at the large end of the ogive and at the same time turns a neck on the shank next to the undercut and where the end of the thread will come.

3. As the form tool is withdrawn, the cross-slide is pulled forward by a cam-actuated lever. On the slide is a circular two-point threading tool which is brought into contact with the shank of the casting. At the same time, a follower nut is brought into contact with a leadscrew, cut on the hub of the chuck. This causes the chaser to feed toward the headstock and cut a thread on the shank of the piece. Inward feed is not sufficient to make the chaser cut the full thread in a sin-

Finished castings issue from special washing machine, at left, pass through the marking machine (horizontal dial, center), undergo inspection and are packed immediately

gle pass, as this would put too much torque on the work and cause it to slip. For this reason, the track cam reverses the cross-slide, disengaging the chaser which is returned longitudinally to its starting position by a spring compressed on its prior feed. Then the cam feeds the chaser to full depth and the tool is again advanced longitudinally by the lead-screw, completing the thread. Finally, the tools is again backed off and is returned to starting position, where it remains until the next piece is ready for threading. This completes the machining.

4. At this point, the Microswitch is opened, causing the air to be shut off and the air cylinder exhaust to be opened, purging the cylinder and admitting low-pressure air to the opposite side of the ram, which is thus withdrawn. As this occurs, the ejector pushes the casting out of the chuck and it falls onto the cross-slide and is removed by hand to a chute which carries it to a washing machine, completing the cycle.

As one solenoid holds the air valve open to apply pressure to the ram, a second solenoid valve is opened to supply coolant to the work, the coolant being shut off as the ram is withdrawn and the work ejected. Momentary opening of an air valve blows any chips out of the chuck just before the workpiece is entered.

Clearly, the set-up described not only takes full advantage of the economies of die-casting parts with excellent finish at a high rate but does such machining as is required on a rapid and highly economical basis. One punch press operation removes flash, and two simple automatic machining operations yield the finished product ready for inspection. A small amount of scrap is produced, but it represents only negligible net waste, as all rejects are remelted, along with sprues, gates and chips. This is in marked contrast to production from bar stock by machining, as in that process the scrap in chips is great and labor costs higher.

Both the snap gage, which measures the neck between thread and shoulder, and the dial gage, shown in the foreground, for checking the length from shoulder to end of shank, are fixed to the inspection bench

True Circular-Arc Tooth Profiles Provide Accurate Gears

BY ERNEST WILDHABER, GLEASON WORKS

Freedom from undercut, a gradual tooth engagement and simple layout result from circular-arc profiles

THE TOOTH PROFILES of mating, uniform-motion gears, running on parallel axes, call for requirements which can be fulfilled by involutes of a circle. They can be produced accurately and efficiently and a comparatively simple tool produces the shape in a rolling, generating motion. While they are used almost exclusively today, they are by no means the only tooth profiles possible.

In the days of cast gears, which were not machined, other tooth shapes were also widely used, and it was then a question of the merits of the tooth shape rather than the method of production. In those days circular-arc profiles must also have been used, because they were easy to lay-out. They were, however, based on involutes and represented their curvature circles. Their value, as tooth profiles, therefore, left much to be desired inasmuch as their transmission of uniform motion was merely an indiscriminate approximation.

In line with current practice, circular-arc profiles are here treated as circular arcs and not merely as approximations of some other curves. Treated thusly they can transmit uniform motion, and have been of great use in cutting bevel gears by the Revacycle Process, described in an earlier number.

One of the advantages of the circular-arc profile, as compared with the involute, is that it has no base circle where the profile ends in an excess of curvature. Because circular arc teeth are entirely free from undercut, it is not necessary to correct the addendum proportions of a gear pair to the extent required on involute teeth. In addition to this there are other qualities which come very naturally with circular-arc teeth.

In analyzing gear teeth in general, it is assumed that they are absolutely rigid and without elastic deflection. Profile curves which should transmit mathematically true uniform motion are then determined. These curves would give excellent tooth profiles if it were possible to attain absolute rigidity, and if it were possible to avoid even a minimum of spacing and tooth profile error. Although these requirements have not been met, great strides have been made in reducing these errors. Today, gears of 3 to 10-in. diameter can be made commercially with a maximum tooth to tooth spacing error of 0.0002 to 0.0003 in. This may add up to 0.0004 in. in a gear pair, when two high teeth come together.

Long ago it was found that all this should be allowed for in the design of the tooth profiles. Greatly improved results have been obtained by modifying the mathematical tooth profiles in such a way as to ease off the profile ends slightly. In this way it is possible to obtain a most gradual tooth engagement and smoother running gears. The mathematical tooth profile represents, therefore, not so much an ultimate goal as a starting point from which to plan profile ease-off corresponding to the accuracy of gear production, to the elastic deflections of the teeth and, on bevel gears, to deflections and inaccuracies in the mounting.

Fig. 1 is a diagram, showing a pair of contacting circular tooth profiles of a pinion and a gear, having parallel axes C_P and C_G. Fig. 2 is a fragmentary view of a pair of gears, whose profiles are single circular arcs, determined as outlined below.

In Fig. 1 the profile pair is shown in contact at pitch point O, which is the contact point of the pitch circles shown in Fig. 2. $OC_P = r$, and $OC_G = R$ are the radii of these pitch circles, and are proportional to number of teeth.

The tooth normal PQ, at the point of contact O, is inclined to the direction of the periphery at the pressure angle ϕ, and contains P and Q, the centers of the circular-arc tooth profiles. If the teeth were involute teeth, normal PQ would be the line of action, and would be tangent to the base circles at the points at which centers C_P and C_G are projected at right angles to the line PQ. These projection points, at the intersection of line PQ with the shown projection lines, are the curvature centers of the involutes. Their distances from pitch point O are the curvature radii, and are seen to amount to $r \sin \phi$ and $R \sin \phi$ respectively.

It should be noted that center P of the circular pinion tooth profile is located on normal PQ and at a greater distance from pitch point O than the projection of pinion center C_P. Center Q of the circular gear tooth profile is located between the projection of gear center C_G and pitch point O. The distances of the profile centers P and Q from pitch point O may be determined from the formulas:

$$PO = \frac{3\, r \sin \phi}{2 + \frac{r}{R}}$$

$$QO = \frac{3\, r \sin \phi}{1 + 2\,\frac{r}{R}}$$

whose derivation will be outlined at the end of the article.

These formulas still apply when the pinion addendum is made larger than the gear addendum, as illustrated in Fig. 2. The profile radius of the pinion is then larger than distance PO, and the profile radius of the gear is smaller than distance QO by the same amount. Thus, the sum of the profile radii equals distance PQ. These formulas give tooth profiles which stay close to each other. At the same time, they tend

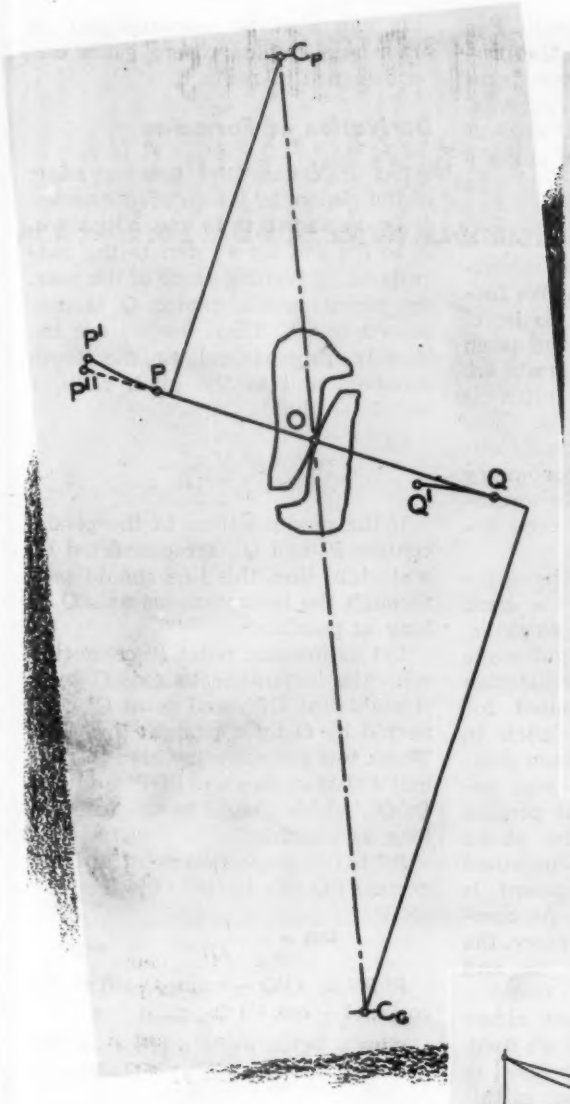


Fig. 1—A pair of contacting circular tooth profiles of a pinion and gear, having parallel axes C_P and C_G

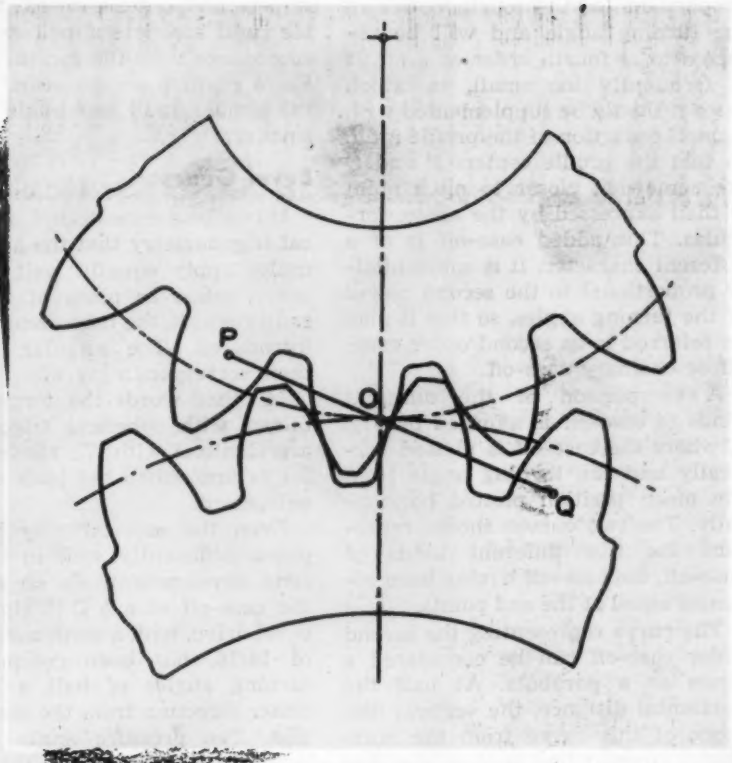


Fig. 2—Fragmentary view of a pair of gears, whose profiles are single circular arcs

Fig. 3—Comparison of two kinds of ease-off. The ease-off is plotted vertically, and the turning angle from the mean position plotted horizontally

to separate rather than interfere with each other when turned about the gear axes, through angles inversely proportional to the tooth numbers. This is true for turning in either direction from the shown mean position.

The accompanying table lists the profile separation obtained when turning mating gears through half an angular pitch from the mean position. The upper figure refers to the turning direction as shown in Fig. 1, where the profile center P' of the pinion moves towards a position P^1 further away from the pitch point O. The lower figure refers to turning through the same angle, in the opposite direction. Note that the figures are almost identical.

The two end positions are half a pitch away from the mean position, and a full pitch away from each other. The profile separation obtained at the end positions can be considered as a measure of the profile ease-off. It is determined by computing the distance between the profile centers after turning, and subtracting the sum of the profile radii.

The table refers to gears of 5 D.P. and to various gear combinations and ratios. For gears having the same tooth numbers as listed, but a different pitch, multiply the values given by five and divide by the diametral pitch.

Note how fast this ease-off is reduced with increasing tooth numbers. When the tooth numbers are doubled, the ease-off is cut down to about one eighth, or $(\frac{1}{2})^3$. When the tooth numbers are increased 50 percent to $\frac{3}{2}$ of the original numbers, the ease-off is reduced to about $\left(\frac{2}{3}\right)^3 = \frac{8}{27}$ of original amount. Thus $\frac{8}{27}$ times the 0.000445-in. ease-off of the 18/36 tooth combination is 0.000132 in., which compares well with the figure of 0.0001326, computed directly for the 27/54 tooth combination.

For any given tooth combination the ease-off at half the turning angles, that is, at a quarter pitch from the mean position, is only $(\frac{1}{2})^4 = \frac{1}{16}$ of the value given. In other words,

this kind of ease-off is substantially proportional to the fourth power of the turning angle and will be referred to as fourth order ease-off. It is frequently too small, in which cases it should be supplemented with a small reduction of the profile radii, so that the profile centers P and Q are somewhat closer to pitch point O than expressed by the above formulas. This added ease-off is of a different character. It is substantially proportional to the second power of the turning angles, so that it may be referred to as second order ease-off or ordinary ease-off.

A comparison of the different kinds of ease-off is afforded by Fig. 3, where the ease-off is plotted vertically and the turning angle from the mean position plotted horizontally. The two curves shown represent the two different kinds of ease-off, the ease-off having been assumed equal at the end points.

The curve representing the second order ease-off can be considered a circle or a parabola. At half the horizontal distance, the vertical distance of this curve from the horizontal straight line is ¼ of the distance at the end.

The fourth order ease-off leaves the central profile portions practically unaffected, but is effective at the profile ends. This ease-off, so to say, starts near the profile ends rather than at the middle, but then it starts fast. It keeps the outside edges of the teeth out of contact under all conditions, and thereby wards off many undesirable tooth difficulties.

The fourth order ease-off of circular arc tooth profiles depends on the tooth combination, the pitch and the pressure angle. The second order ease-off is under full control, through the selection of the profile radii. For zero second order ease-off, the profile radii are determined exactly in accordance with the formulas given. For a positive second order ease-off the profile radii are made slightly smaller.

Bevel Gears

It can be demonstrated by spherical trigonometry that the above formulas apply equally well to bevel gears, when in place of the pitch radii r and R, the back cone radii are introduced. The angular pitch is then correspondingly altered.

In other words the formulas obtained with spherical trigonometry are identical with the above formulas as applied to the back cone development.

Even the ease-off may be computed sufficiently well in the back cone development. As an example, the ease-off of a 5 D.P. right-angle bevel drive, with a tooth combination of 10/16, has been computed for turning angles of half a pitch in either direction from the mean position. The pressure angle was assumed as 22½ deg., and the profiles were determined from the above formulas. The ease-off as computed in the back cone development is 0.00107 in. and 0.00110 in. As computed by spherical trigonometry, the exact ease-off is 0.00120 in. and 0.00122 in.

The coincidence is much closer when larger tooth numbers are used. Such low tooth numbers are used in automotive differentials and, in this application, they need all of the computed ease-off.

Bevel gears, of substantially this character, are produced in the Revacycle process, and have an outstanding performance record.

It can also be contemplated in other applications where gears can be designed in pairs.

Derivation of Formulas

Let θ^1 denote the turning angle of the pinion, by which profile center P is displaced from mean position P to P^1; and let θ^{11} denote the corresponding turning angle of the gear, by which profile center Q is displaced to Q^1. These angles are inversely proportional to the tooth numbers and to the pitch radii, r and R, so that

$$\theta^{11} = \theta^1 \times \frac{r}{R}$$

If the new positions of the profile centers P^1 and Q^1, are connected by a straight line, this line should pass through the instantaneous axis O as long as possible.

Let us imagine point P^1 connected with the instantaneous axis O by a straight line OP^1, and point Q^1 connected by O by a straight line OQ^1. These two lines are inclined to normal PQ at angles $\alpha = POP^1$ and $\beta = QOQ^1$, which should be the same as long as possible.

P^{11} is the projection point of P^1 to normal PQ. We have

$$\tan \alpha = \frac{P^1 P^{11}}{OP^{11}}$$

$$P^1 P^{11} = (PO - r \sin \phi) \sin \theta^1 + r \cos \phi \ (1 - \cos \theta^1)$$

$$OP^{11} = PO + r \cos \phi \sin \theta^1 - (PO - r \sin \phi) \ (1 - \cos \theta^1)$$

For very small angles θ^1, the sine and cosine functions can be written as

$$\sin \theta^1 = \theta^1 + \cdots$$

$$(1 - \cos \theta^1) = \tfrac{1}{2} \theta^1{}_2 + \cdots$$

where θ^1 is to be introduced in radians, and where the dots indicate higher orders in θ^1 than $\theta^{1^3} + \cdots$

$\tan \alpha$ can then be put down as

$$\tan \alpha = C^1 \theta^1 + B^1 \theta^{1^2} + \cdots$$

after some transformation, wherein C^1 and B^1 are constants.

Similarly $\tan \beta$ can be written as

$$\tan \beta = C^{11} \ \theta^{11} + \beta^{11} \theta^{11^2} + \cdots$$

$$= C^{11} \frac{r}{R} \theta^1 + \beta^{11} \left(\frac{r}{R}\right)^2 \theta^{1^2} + \cdots$$

The angles α and β remain alike longest when

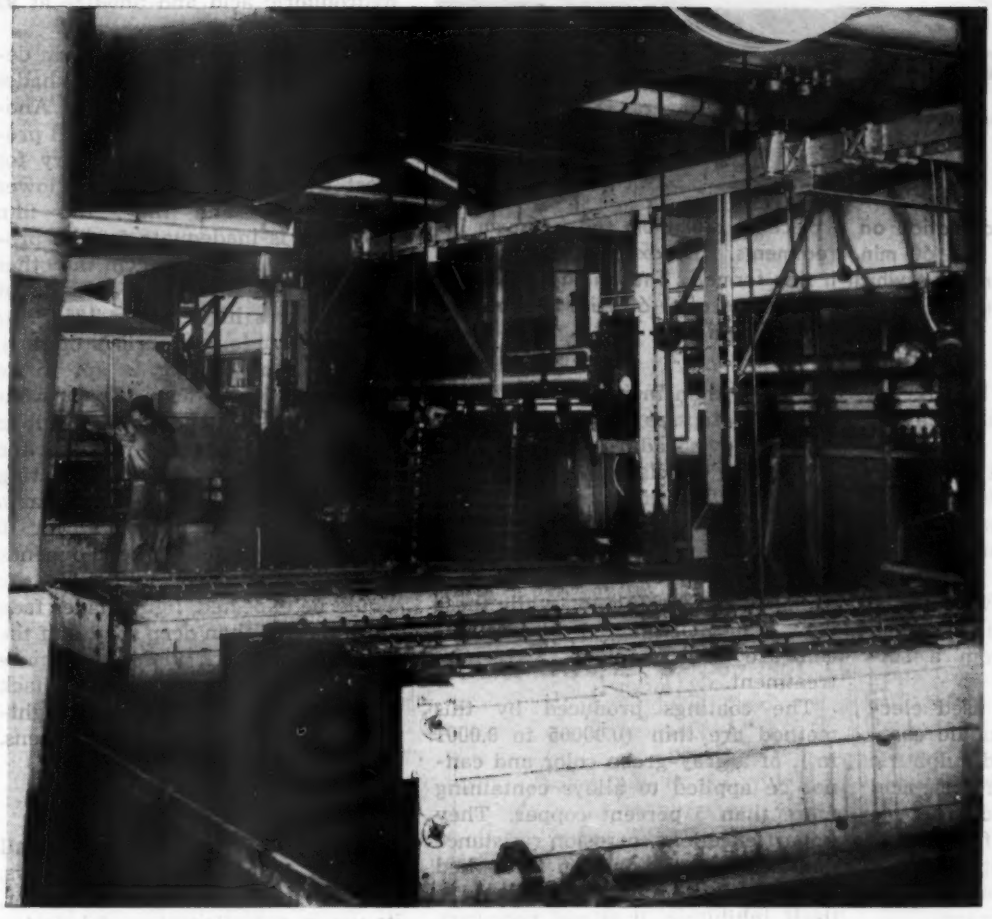
$$C^1 = C^{11} \frac{r}{R} \text{ and } \beta^1 = \beta^{11} \left(\frac{r}{R}\right)^2$$

The aforesaid formulas can be obtained from the above two relationships.

EASE-OFF OF GEARS WITH CIRCULAR ARC PROFILES

Ratio	1/00		½		1/1		
Tooth Numbers							
Pinion	12	18	18	27	24	36	48
Gear	rack	rack	36	54	24	36	48
Turning Angles:							
Pinion	15°	10°	10°	6°40′	7°30′	5°	3°45′
Gear	0	0	5°	3°20′	7°30′	5°	3°45′
Profile Separation: thousandths in.							
One Direction	0.395	0.118	0.445	0.1326	0.453	0.134	0.057
Opposite Direction	0.411	0.121	0.450	0.1334	0.453	0.134	0.057

NOTE: Gears have 20 deg. pressure angle, 5 D.P. East-off is given in thousandths of an inch. Turning angle is expressed for each side of mean position. Profile separation is the total ease-off.



Parts to be anodized are mounted on racks and lowered into the tanks in batches. Close control of the process is maintained by controls at each tank. Constant recorders provide a running record of operations and indicate accurately conditions of operation necessary to maintenance of anodizing solutions and equipment. Large volumes of fume-laden air must be removed from the vicinity of operations and neutralized or discharged safely to the atmosphere

Anodic Treatment of Aluminum Gives Corrosion Resistance

BY W. L. MAUCHER, REFRIGERATOR ENGINEERING DIVISION, GENERAL ELECTRIC COMPANY

THE PERFORMANCE of aluminum and its alloys in meeting the rigorous demands of war has been paced by processing methods which have contributed to requirements of durability under difficult conditions. Chief among these requirements has been surface finish with particular emphasis on corrosion resistance.

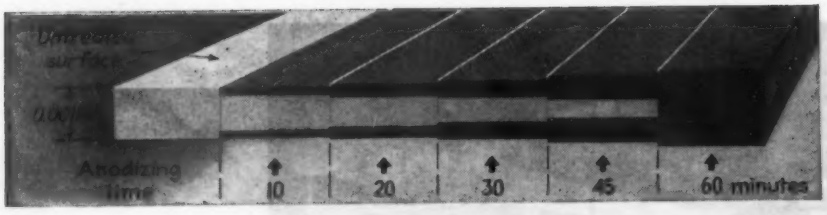
Anodic treatment of aluminum and its alloys stands out as affording: basic protection to the metal; an excellent base for paint and lacquer films; electrical insulation; surface hardness; and decorative effects. Application of anodic coatings to aluminum was patented in England in 1924 by Bengough and Stewart. It was developed at that time to protect duralumin seaplane parts from corrosive attack by sea water.

Several different electrolytes can be used for anodic coatings, but chromic acid and sulphuric acid are the two most widely employed. The

Effects of electrical treatment of aluminum increase corrosion resistance and, in some cases, surface hardness. Paint adhesion and appearance are improved

method of anodizing is directly opposite to the electroplating process. In electroplating, the deposit is formed on the cathode and the coating grows outward from the metal surface. In anodizing, however, the film is formed at the anode and progressive oxidation occurs beneath the initially formed anodic film and grows inward toward the metal.

Coatings produced by anodizing are porous, permitting the current to continue flowing. The electrolytes, however, have an appreciable solvent action on the coating formed. Under some conditions of electrolytic treatment, this solvent action may be so pronounced that, instead



The progress of anodic oxidation on a piece of aluminum foil is shown in steps of 10, 20, 30, 45, and 60 min. treatments. The oxide has a greater volume than the aluminum from which it was formed. The original foil had a thickness of 0.00114 in. The increase in volume after 60 min. is equal to one third the original

of the anodized part having an increased thickness, it might have a reduction in thickness. These dimensional changes must be taken into consideration where close dimensional tolerances are involved.

The film formed on aluminum by anodizing is essentially aluminum oxide, Al_2O_3, together with some minor inclusions from the bath, such as sulfates deposited from a sulphuric acid solution.

The two most widely used electrolytes for producing anodic coatings are chromic acid and sulphuric acid, although solutions of boric acid or borax have been used where a thin, highly impervious film is required, such as that deposited on aluminum foil used in the construction of electrolytic condensers.

Common to all types of anodizing is the necessity for securing a clean metal surface. If uniform coatings are to be obtained, it is essential to remove all oil, grease, and any other surface contamination. The usual procedure is to clean the parts in a solvent degreaser or in a hot inhibited alkaline cleaner. If an etched surface is desired, or if dimensional tolerances are not a consideration, a stronger caustic cleaner is used. All traces of cleaning solutions should be removed by thorough water rinsing before placing the parts in the anodizing solution.

Chromic-Acid Process

Chromic-acid anodizing is usually carried out in a welded steel tank equipped with heating and cooling coils to maintain the temperature of the bath at 95 F. ± 5 F. The electrolyte consists of a 5 to 10 percent chromic acid solution which is provided with gentle agitation by compressed air, and suitable ventilating ducts are required to remove spray and mist.

The parts to be treated are made the anode, and the tank usually serves as the cathode. Using a suitable d.c. source, a low voltage (about 5 volts) is applied at the start and then increased to 40 volts in 5-volt steps as rapidly as possible without overloading the generator or burning the clamps or parts being anodized. This may require five or more minutes, after which anodizing is continued for 15 or 30 min. Alloys containing up to 1 percent silicon are anodized for 30 min., while those containing more than 1 percent silicon are usually given a 15-min. treatment.

The coatings produced by this method are thin (0.00005 to 0.0001 in.), of a gray-green color and cannot be applied to alloys containing more than 5 percent copper. They impart excellent corrosion resistance and afford good adhesion to applied paint coatings. Since chromic acid is itself inhibitive, it is not necessary to remove entrapped electrolyte from seams and crevices, such as are found in spot-welded assemblies, so that this process is widely used on aircraft and other military equipment parts.

The maintenance of the chromic-acid electrolyte is comparatively simple. It consists merely in obtaining the specific gravity by means of a hydrometer and the *pH* value with a glass electrode *pH* meter. Suitable charts have been prepared so that with these two readings, the condition of the bath can be found and the necessary chromic-acid additions made as required.

Since the chromic-acid anodic coatings are normally thin and dense, they do not lend themselves to producing dyed coatings. However, by certain modifications of the anodizing procedure, satisfactory black dyed coatings can be obtained. Tests indicate that varying the anodizing time and bath temperature has a profound influence on the quality of color produced.

Die-castings of No. 13 alloy (12 percent silicon) because of their high silicon content are more difficult to blacken. However, fair full black finishes can be obtained by giving them a preliminary etch in hydrofluoric acid and anodize at 95 F. for 15 minutes.

A suitable technique has been developed for producing pastel shades by the chromic-acid process. Anodizing at 125 F. for 60 min. will produce films that are satisfactory for most dyeing purposes. With lower temperatures and time, the film thickness is inadequate for the production of deep colors. On the other hand, if the anodizing is done at temperatures higher than 125 F. or at 125 F. for longer periods of time, the resultant coating is apt to be uneven and powdery. To prevent bleeding of the applied color, it is found generally necessary to set the dye by immersing the dyed coating in a solution of nickel acetate at a temperature of 200 to 210 F. for 10 to 20 min. Light fastness depends chiefly on the nature of the dye. As would be expected, light shades fade more rapidly than deep shades of the same color. Dark violet-reds, pure yellows, dark violet-blues, and black are more readily obtained in light-fast colors than pure blues, greens, and yellow-greens.

Sulphuric Acid Process

This process is applicable to all types of aluminum and its alloys, whether wrought or cast. However, its use is not allowed on fabricated parts which have seams or spot-welded lap joints, because of the possibility of some of the sulphuric-acid electrolyte becoming entrapped with subsequent corrosion in these areas.

In anodizing by this method, lead-lined steel tanks are generally used, and this lead lining usually serves as the cathode during electrolysis. The aluminum parts being treated are made the anode. It is necessary to provide the anodizing tank with suitable cooling coils so that close temperature control of the electrolyte can be maintained at all times. The electrolyte consists of a 15 to 25 percent solution of sulphuric acid which is agitated by compressed air. Ventilating vents are required to remove spray and mist. The cleaning preparatory to anodizing is carried out in a manner described for the chromic-acid process.

There are two general types of coatings produced in sulphuric-acid anodizing—plain coatings and dyed coatings. Where corrosion resistance is the prime consideration and color is not important, the first type is used. However, when color and appearance are desired, the dyed coatings are applied. The selection of operating conditions will depend

upon the particular kind of coating which is desired. Generally, an electrolyte of 15 to 18 percent of sulphuric acid is used. By adjusting the current density and temperature, practically all of the commercial anodic finishes can be produced with this electrolyte. Uncolored or "plain" coatings are formed at a temperature of 68 to 74 F., whereas the coatings to be dyed are usually formed at 84 to 88 F. The reason for using the higher temperature for the dyed coatings is that it produces greater porosity, which is beneficial in absorbing more of the dye.

All of these coatings are porous as they come from the electrolytic bath. This porosity lowers the resistance to corrosion and permits undesirable staining, unless they are given a sealing treatment which makes the oxide coating impermeable and non-staining.

For undyed coatings, the sealing process is a treatment either in boiling water or a boiling solution of sodium dichromate. The latter treatment imparts a yellow color but affords maximum corrosion protection. The hot water sealing, however, is effective and is commonly used on parts such as ice cube trays where chemical solution sealing would be objectionable from the health standpoint. The sealing treatment converts the alumina (Al_2O_3) produced by the anodic process to aluminum monohydrate ($Al_2O_3.H_2O$). In this way, the coating which was previously porous and adsorptive becomes impermeable and non-adsorptive.

Sealing Dyed Coatings

In preparing dyed coatings, the usual procedure had been to follow the dyeing operation with a sealing and dye-fixing treatment in nickel-acetate solution. It was found, however, that the corrosion resistance of such coatings was not sufficiently good to pass the government 250 hr. salt spray test. The Aluminum Company of America subsequently recommended an additional sealing in a 1 percent sodium-dichromate solution, for it was found that this low concentration of dichromate was not enough to alter the color of the dyed coating, and yet it improved the corrosion resistance sufficiently to meet the salt spray test requirement.

Anodic coatings in sulphuric-acid electrolyte have a thickness of about 0.0004 in. after a 30-min. treatment with a current density of 12 amp. per sq. ft., and 0.0007 to 0.0008 in. after a 60-min. oxidation.

When parts are to be anodized by either the chromic- or sulphuric-acid process, it is important to make sure that they do not have inserts or assemblies of other metals connected to them, for the reason that such extraneous metals would be rapidly corroded away during anodizing, and also they tend to steal the current during the process and militate against forming a good oxide coating on the aluminum.

TEMPERATURE AND TIME OF ANODIZING PRIOR TO DYEING

95 F.	110 F.	125 F.	Appearance After Dyeing
30 min.	.....	.....	Light Gray
60 min.	30 min.	.....	Dark Gray
90 min.	60 min.	30 min.	Fair Black
120 min.	90 min.	.....	Good Black
180 min.	120 min.	60 min.	Best Black

Characteristics of Coatings

Corrosion Resistance—One of the outstanding characteristics of anodic coating is its resistance to corrosion. Advantage of this property is taken in the manufacture of aircraft and other military equipment, architectural structural parts and household appliances. For example, refrigerator ice-cube trays which were made of unanodized aluminum soon became discolored and pitted in service. The application of the anodic treatment, however, not only prevented the discoloration but eliminated pitting troubles. Aluminum and, more particularly, its alloys containing copper such as 17S and 24S, are prone to corrosion when exposed to salt atmosphere. This condition is encountered in aircraft parts and miscellaneous Army and Navy equipment. Here again, anodizing is widely used to combat the severe corrosion conditions encountered. On architectural parts, such as window frames, spandrels, mullions and the like, the oxide coating maintains a hard surface which is readily cleaned and retains its appearance over long periods. For the best corrosion resistance, oxide coatings are often used in combination with paint. The anodizing affords not only basic protection, but also is an excellent base for paint and lacquer films.

Electrical Characteristics — Anodic coatings formed on aluminum and some of its alloys have good dielectric qualities. For example, a coating of 0.0005 in. thickness made in sulphuric-acid electrolyte and sealed in hot water, may have a breakdown voltage as high as 500 or 600 volts. However, there may be some weak spots in the coating and certain spots could be substantially lower, say 200 to 300 volts. The voltage breakdown value of some of the high silicon alloys is even lower and might average only 25 to 50 volts. This lower range of values also applies to chromic-acid anodized films and likely is due to the fact that they are much thinner than the sudphuric-acid coatings. One important feature of the oxide coating as an insulating medium is that it is stable when heated and does not char or give off gas as organic insulations will do when heated sufficiently. The cost of application, however, is one factor which limits its use.

Resistance to Abrasion—Some anodic coatings have a high resistance to abrasion. The hardness of the corundum-like finish may readily be observed by rubbing it with a piece of steel wool. It will not smudge as bare aluminum sometimes does when rubbed against a white cloth. This hardness is one of the properties which has made these finishes so valuable for cafeteria trays, bus and streetcar handrails, and for numerous other applications where hard surfaces are essential.

The anodic process of finishing aluminum surfaces is applicable to most aluminum parts and is desirable or necessary for most applications of the material. The formation of an oxide of the base metal on its surface extends the uses of aluminum to products that would ordinarily require specially alloyed metals to resist the attack of corrosive materials and atmospheres. Addition of increased resistance to corrosion to its other desirable characteristics does, in some cases, present definite economic advantages over other materials as well as physical advantages. Light weight, ductility, machinability and a relatively low base cost would not be sufficient cause to warrant its extensive use if the stability offered by anodic treatment were not available for full corrosion protection.

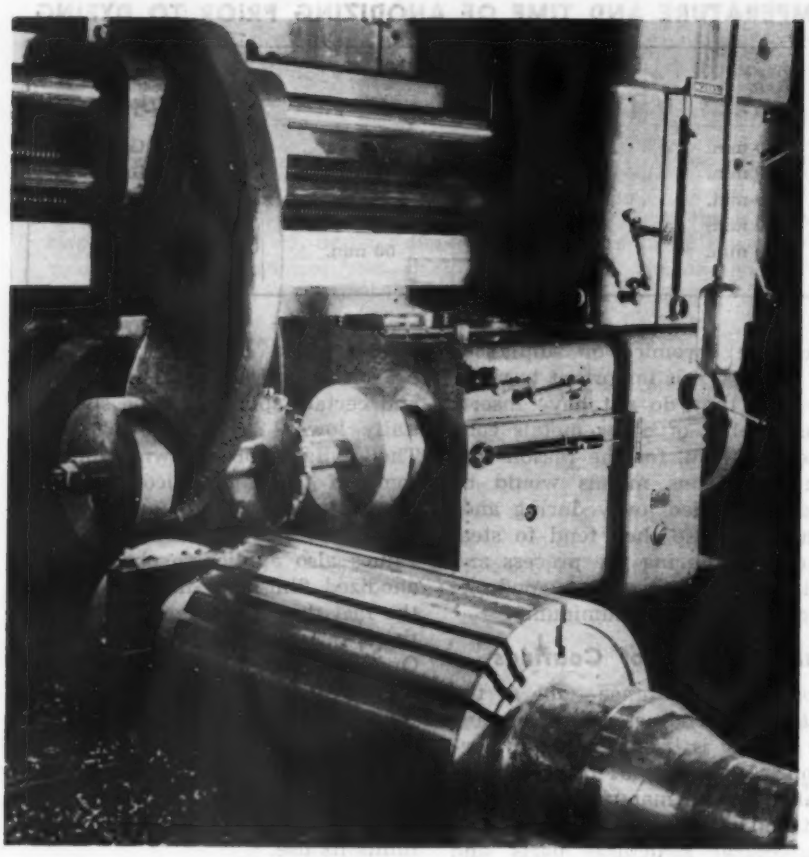


Fig. 1—Note the finish where the light reflects at the end of the slot. These slots were formerly roughed on a planer and finish milled with high-speed steel cutters. The cutting time was reduced from approximately 20 hours to 2½ hours. Machine—60 × 6-in. Ingersoll planer-miller; arbor dia.—2½ in.; spindle motor hp.— 50; cutter body—boiler plate; tips—¼ × ½ × ¾ in. Carboloy 78B (torch brazed); no. of teeth—16 (stagger tooth); dia. of cutter—14½ in.; radial rake—minus 10 deg.; axial rake—minus 3 deg.; corner of tooth—1/16 in. radius; two flywheels on arbor—14 in. dia. × 3½ in. thick, 145 lb. each; one flywheel on spindle extension—20 in. dia. × 3⅝ in. at hub and rim (215 lb.); width of cut—0.885-0.895 in.; depth of cut—4 11/16 in.; length of cut—39 in.; type of cut—climb; speed—130 r.p.m. (120 r.p.m. while cutting) or 455 s.f.p.m.; feed—7 in. per min. or 0.0073 in. per tooth; power required—38 hp.; no. of slots per grind—7 (0.003 in. removed from each tip on periphery and radius to regrind); material—special steel forging with magnetic properties; material analysis—carbon, 0.35-0.45; manganese, 0.50-0.80; Brinell hardness—160-180

Carbide-Tipped Cutters Work Well With Heavy Cuts on Cast Steel

Good operators and careful tool grinding contribute to success in introducing negative-rake cutters for use on soft steel

ABOUT a year ago, the Elliott Company began the milling of steel with carbide-tipped cutters. Because of the heavy nature of most of our operations and the softness of the steels machined, generally accepted practice in milling with carbides could not be followed. Available information had to do with comparatively light operations and equipment and with hard materials. Nevertheless, our experimental work proved successful and the information gained has been put to production use. And it should be said that the interest displayed by our tool grinders and machine operators has had an important bearing upon the outcome.

There are two great advantages of using carbide-tipped milling cutters for heavy work:

1. If the chips are kept off the work, practically no heat is generated in the work, making it possible to run a finishing cut immediately after a roughing cut.

2. If the work is not clamped or held securely, the cutter will push the work away rather than dig in, because of the negative angles on the tip. This has happened while face-milling expensive steel castings when the job could have been ruined with high-speed steel cutters.

Fig. 1 shows a job recently adapted to carbide milling. Coil slots are finish milled in these turbo-alternator rotors in one pass. The first difficulty encountered was excessive gear noise and vibration; to overcome this, a 215-lb. flywheel was added to the spindle end, in addition to the two 145-lb. flywheels already on the arbor.

There is a steel bushing on the milling machine spindle which runs in a bronze bushing on the arbor support. Because of insufficient lubrication the steel bushing became heated to such an extent that there was no longer any clearance between it and the bronze bushing. When this took place the steel bushing turned on the arbor and chewed it up so it had to be cut off. The arbor support bushing was bored out to give 0.0015-in. clearance between the arbor support bushing and the arbor bushing. Instead of oil, 130-

AA Lubriplate was used to eliminate overheating.

The cutter shown in Fig. 2 was made specifically for us by McCrosky Tool Company after considerable experimenting, and it is an excellent cutter for the purpose for which it is intended. The first consideration is to remove steel as fast as possible with the horsepower available, even though some tool life is sacrificed. This is feasible because there are few jobs going through the heavy machines which involve a large number of pieces.

With this cutter, rectangular forgings of steel identical to that shown in Fig. 1 have been milled, taking cuts ⅜ in. deep by 7 in. wide by 50 in. long, with a feed of 17 in. per min. After nine of these cuts, the tips showed abrasion on the periphery the of cutter approximately 1/32 in. back of the cutting edge, with no indication of chipping. The forgings were clamped flat on the machine table. No flywheel was used.

It is common practice when milling boiler plate with these cutters, and when the depth of cut is not more than 3/16 in., to use top speed and feed on the machine, giving a surface speed of 535 ft. per min. and a feed of 40 in. per min. The chip thickness per tooth is 0.016 in.

Fig. 3 shows a job which is not a heavy machining operation, but has been so successful from the standpoint of saving time and superior finish that it should be included as one of the company's most interesting jobs. Before mounting the flywheel on the arbor, 7 in. per min. was the heaviest feed that could be used without causing much noise and vibration in the spindle gears. There is no trace of vibration in the operation as shown. By changing from Carboloy 78B tips to 78—everything else remaining the same—the pieces per grind increased from 30 to 100. Grade 78 is harder, more wear-resistant than 78B.

Fig. 4 shows a job which is half of a d.c. generator field frame. The two halves must be watertight when bolted together without any gasket. Before using carbide-tipped milling cutters on this job, one of these frame halves had been on a machine for as long as three shifts, trying to get a satisfactory finish. Now it is machined readily with carbide tips.

Fig. 2—10-in. heavy-duty face mill with these specifications: body thickness, 3 in., no. of teeth, 12; blade size, ¾ × 1⅜ × 2½ in.; blade lock, McCrosky "Jack-Lock" wedge; tip, ¼ × ½ × 1 in. KM Kennametal; radial rake, 0 deg.; axial rake, minus 5 deg.; bevel angle, 20 deg.

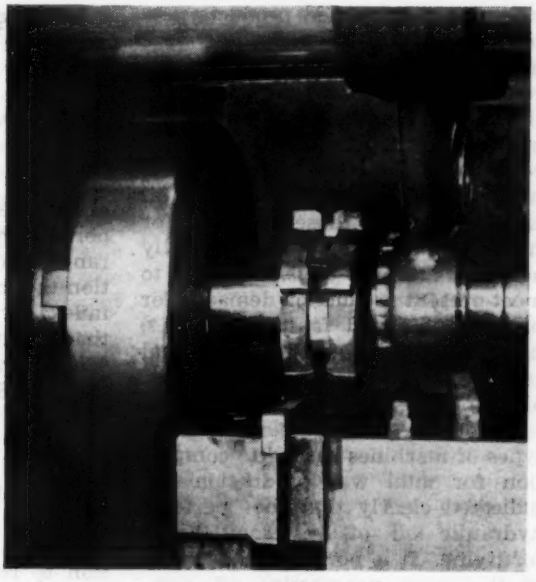


Fig. 3—Over-all time on this operation is approximately a third of the former time. Also finish and accuracy are greatly improved. Machine—No. 2 K Kearney & Trecker; arbor dia.—1½ in.; cutter body—boiler plate; tips—¼ × ½ × ¾ in. Carboloy 78 (torch brazed); cutter dia.—side, 5½ in.—center, 4½ in.; no. of teeth—6 each cutter; radial rake—side, minus 10 deg.—center, minus 5 deg.; axial rake—side, minus 3 deg.—center; minus 5 deg. alternate angles; flywheel—10 in. dia. × 2⅝ in. thick, 55 lb.; stock removed—3/32 each side, 1/16 on top, 7⅝ in. long; speed—700 r.p.m., or 1,000 and 825 ft. per min.; feed—21 in. per min. or 0.005 per tooth; pieces between grinds—100; material—SAE 1010 C.R.S. (stress relieved)

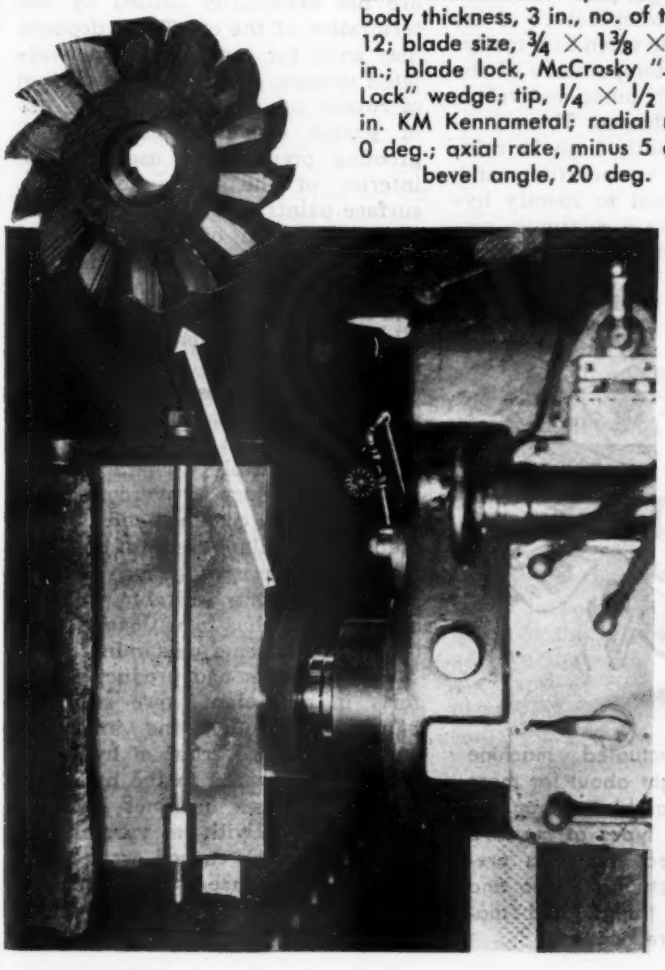


Fig. 4—Machine: No. 350-T Giddings & Lewis horizontal boring, drilling and milling machine; cutter body—Meehanite; tips—⅛ × ½ × ½ in. No. 831 Carboloy (torch brazed); dia. of cutter—10 in.; no. of teeth—14; radial rake—minus 10 deg., axial rake—minus 10 deg.; corner of tooth—1/32 in. × 45 deg. chamfer; depth of cut—0.010-0.015 in., speed—330 r.p.m.—or 865 ft. per min.; feed—6.5 in. per min. or 0.0014 per tooth; material—rolled plate; finish—comparable to ground finish

Additives Improve Hydraulic Oils

BY W. G. HUEBLER, MANUFACTURING ENGINEER, WESTINGHOUSE ELECTRIC CORPORATION

Hydraulic headaches are often caused by conditions beyond the control of the oil supplier or the manufacturer of the machine. Providing the cure before the trouble exists is the function of hydraulic additive agents

THE FLUID MEDIUM in an oil hydraulic system is basically petroleum because it is the logical material to use from a standpoint of availability, adaptability and cost. Several years ago when hydraulically actuated machine tools first appeared on the market, oil recommendations involved highly refined products patterned after turbine oils. These were usually conventionally refined oils considered by many authorities of the day to be the ultimate for oil hydraulic systems. It was generally conceded that the characteristics necessary for a good hydraulic oil were similar to those required for turbine lubrication. Hydraulically actuated machine tools, designed to meet present production demands for precision fits and faultless finishes, have brought about far more critical service conditions for the hydraulic oil than did early machine tools.

Experience with some of the latest types of machines rushed to completion for vital war production has indicated clearly that the "perfect" hydraulic oil of yesterday needs fortifying. It is no secret that many of the more progressive oil companies are recognizing the need for improving straight mineral oils for hydraulic service. Important among these are additives which impart higher film strength to hydraulic oils as a means of counteracting the wear in overloaded systems.

At the present time, many manufacturers are revising their hydraulic oil specifications to include, among other factors, greater emphasis on so-called varnishing. One large corporation limits the amount of allowable varnish in its hydraulic oils to 0.05 percent under certain test conditions in the laboratory. However, it should hardly be necessary to point out that this minute varnish formation on laboratory glassware might be many times greater in hydraulic systems where completely different conditions are encountered, including metal catalysts which tend to accelerate varnishing.

Viscosity index is another specification that is being revised upwards. The need for high viscosity index in hydraulic oils has been a subject of much debate. This property of an oil is one which will give suitable performance over wide temperature ranges. Some authorities may question the importance of high viscosity index for this application, arguing that wide temperature ranges are seldom encountered in oil hydraulic systems. Such people place too much emphasis on the temperature of the oil in the reservoir when as a matter of fact, it is the temperature of the oil at the hydraulic pump and valves that must be considered. These temperatures are usually high in relation to reservoir temperatures and, therefore, it is best to specify hydraulic oils having a minimum viscosity change over wide temperature ranges.

Because of the obvious limitations of laboratory glassware tests, it has been found expedient to correlate laboratory test results with shop test results before drawing conclusions as to the suitability of a given oil.

Hydraulically actuated machine tools have brought about far more critical service problems than we found in earlier types of machine tools. The subject matter is presented in a factual manner and charts, graphs, tables, and diagrams are omitted

In fairness to suppliers of hydraulic oil, it must be admitted that their products often are unjustly condemned for faulty machine performance. Shop mechanics may have a tendency to place the blame on oil when trouble occurs. It is not always an easy matter to convince the average machine repairman that the troublesome contamination he discovers in the hydraulic oil is not the fault of the oil supplier. In fact, it is surprising that some oils function as well as they do since there are so many outside sources of impurities to contaminate the hydraulic system.

Resinous deposits, for example, are not necessarily caused by deterioration of the oil. These deposits may exist for a number of non-related reasons, such as decomposition of rubber tubing, indiscriminate use of gasket cements, sealers, rust-proofing preparations used on the interior of the hydraulic system, surface paints that do not resist the stripping action of hot oil, atmospheric dust which enters the hydraulic system through the breather and is not effectively filtered, cutting oils and coolants leaking into the hydraulic system, and numerous other causes. To resist the action of such contaminants, an oil must have exceptionally high chemical stability.

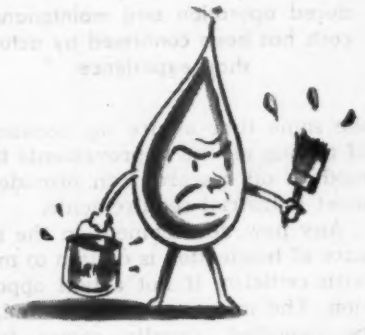
Good demulsibility characteristics are also necessary to overcome contamination by coolants and cutting fluids. High film strength tends to lessen the abrasive action of solid particles and is a desirable property of an oil that has to withstand conditions of extreme contamination.

Several years ago production efforts in one plant were seriously hampered through the inefficient action of a large group of hydraulic shapers. The vanes in the hydraulic pumps of these machines had become coated with a varnish-like substance which caused erratic machine performance, slowdown and, in many instances, complete stoppage. As usual, the hydraulic oil was

at once blamed by machine repairmen for producing this varnish.

A premium trade name oil, recommended by the machine builder, was used in all the shaper hydraulic systems at the time of the trouble. This oil was reputedly blended from straight run, highly refined petroleum stocks. Laboratory inspection of the used oil indicated that it had not become oxidized to any great extent and there was no trace of oil oxidation products capable of producing the varnish.

Further investigation revealed that the oil actually had been acting as



Many manufacturers are revising their hydraulic oil specifications to include greater emphasis on so-called varnishing

a carrier for an oil-insoluble varnish which proved to be the vehicle used in the paint on the sump. A complicated hydraulic system, once contaminated by a material of this nature, requires many man-hours of labor to remove and clean these deposits. In this case the machine builder cooperated to the extent of cleaning and repainting the sumps. However, a certain amount of varnish remained in inaccessible recesses of the hydraulic systems. After more than two years of steady production, it was still necessary to use a hydraulic oil containing a varnish solvent to insure smooth performance of the shapers.

When a hydraulic system becomes contaminated with a gummy or resinous material, solvents are often employed to remove such deposits. These solvents may readily dissolve the gum but, if used to excess, they likewise may have a dissolving or softening action on the sump sealer In such cases where incorrect solvents are used, conditions caused by such softening action may be as bad or worse than the problem for which corrective measures have been taken.

One procedure, in the case of gumming, is to drain the oil, remove deposits from all accessible assemblies and flush the system with a light oil containing about five percent of a suitable gum solvent. The system can then be refilled with a proper grade of treated hydraulic oil containing mild solvency which will remove and hold in harmless solution any gums which may remain. This procedure is, of course, practical only where light gum formations are found. In severe cases of gum deposits, where the gum or resinous material has reached a hard varnish stage, it is unlikely that the combination of a solvent flush and treated hydraulic oil will solve the problem. In these advanced cases, the only cure is complete dismantling of the machine and manual removal of the deposits.

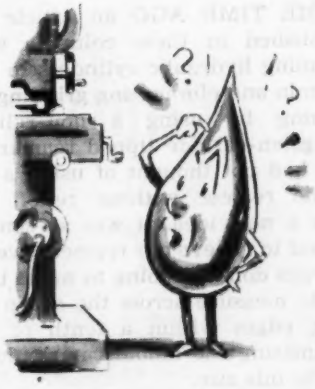
A periodic check of the gum content of the hydraulic oil by laboratory tests to ascertain the extent of this form of contamination insures its removal before the precipitation stage is reached. An occasional Kissling Resins test of the hydraulic oil will indicate to what extent residual gums are being formed. If this value exceeds 0.5 percent, the hydraulic oil should be replaced to prevent gumming of the equipment.

A revealing experience with additive type hydraulic oil incorporating extreme pressure characteristics occurred several years before the war. A newly purchased large vertical broaching machine consistently had reservoir temperatures in the neighborhood of 160 F. At this elevated temperature the oil became too thin to maintain normal operating pressure and as a result there was a prohibitive drop-off in production. The oil being used was in accordance with the machine builder's recommendation. Machine repairmen used every known means to find the cause of this abnormal condition. A cooling coil was installed in the large oil sump but this merely served to delay the eventual pressure drop. Examination of the hydraulic equipment revealed considerable wear accompanied by the formation of a sticky carbonaceous deposit. The engineers concluded that the hydraulic oil lacked sufficient film strength to resist the high pressures and severe wiping action between the moving parts of the hydraulic mechanisms. Frictional heat from metallic contact was sufficient to carbonize the oil and reduce its viscosity below workable limits.

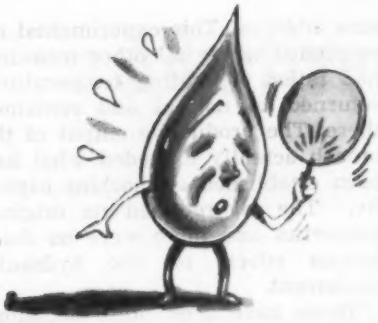
After exhausting all conventional aids in an unsuccessful attempt to solve this difficult lubrication problem, it was decided to try a new type of oil containing an extreme pressure additive. This experimental oil succeeded where all other measures had failed. Operating temperatures returned to normal and remained there. The productive output of the broach actually exceeded what had been established as machine capacity. The oil retained its original properties and there were no deleterious effects on the hydraulic equipment.

There have been other occasions where additives in hydraulic oils have proved of timely aid in smoothing out production kinks. Well-fortified hydraulic oils for general application might be a profitable form of insurance against premature machine wear or breakdown. Wear reduces machine efficiency, interferes with work accuracy and inevitably results in higher costs for machine maintenance and replacement parts. One should not be lured by flowery claims into the assumption that additives have cure-all properties. Reputable concerns spend years of research developing blends of additives in oils, and even then cannot guarantee trouble-free results under all conditions.

In order to measure the benefits of any treated oil, the engineer must be prepared to make careful shop observations including a record of machine repair activity and replacement of machine parts. It is essential that he have the confidence and cooperation of the machine repair department, for it is upon this group that he must depend for his most vital information.



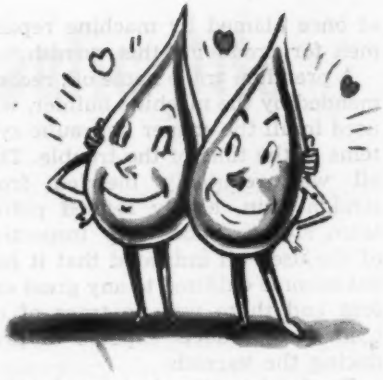
Special properties such as high chemical stability and good demulsibility characteristics may be necessary to overcome contamination of the hydraulic system by outside sources of impurities. In one instance, a shaper supplied with an oil soluble varnish on the sump gummed up; it was necessary to remove the paint and use oil containing a varnish solvent to insure smooth performance



Many hydraulic oils lack sufficient film strength to resist the high pressures and severe wiping action between the moving parts of hydraulic mechanisms. Frictional heat from metallic contact is sufficient to carbonize the oil and reduce its viscosity below workable limits

The primary aim of the lubrication engineer is to derive maximum performance, through proper lubrication, from the machinery for which he is responsible. What it is that makes one oil superior to another is of secondary importance. To those outside the petroleum industry, the blending and compounding of industrial oils is necessarily a mysterious process. With the advent of synthetic chemicals for use with petroleum, many oil engineers were interested because of their own individual needs for improved lubricants. Frank interchange of information between supplier and user of additive oils is gradually bringing to light many of their welcome advantages.

Most hydraulic oil specifications have been evolved coincident with the evolution of petroleum and its compatible additives. If, after exhaustive trial, it is found that an experimental oil has superior qualities, the improvements should be incorporated in the specifications for the benefit of competing oil suppliers. This is very often done with difficulty since oils of almost identical laboratory characteristics do not always perform equally in plant equipment. If greater wear resistance is obtained by means of an additive which increases the film strength, then a higher Almen number or an equivalent measure of film strength may be added to the specifications. Hydraulic oil specifications, like all other oil specifications, have a tendency to become outmoded and therefore must be periodically brought up to date. In this way only is it possible to make reasonable demands upon the suppliers' ability to deliver quality oil and at the same time assure the consumer of getting all the improvements that modern oil research can provide to meet industrial requirements.



The opinion that oils incorporating additives such as chlorinated aromatic compounds may result in reduced operation and maintenance costs has been confirmed by actual shop experience

Any new development in the science of lubrication is certain to meet with criticism if not actual opposition. The main opposition, as might be expected, usually comes from competitors who, lacking initiative and vision, prefer to leave costly and time-consuming research to more progressive marketers.

Reamer Eliminates Honing—Discussion

BY R. A. SCHULTZ
FOREMAN, NOBLETT & FORREST, SOUTH AUSTRALIA

SOME TIME AGO an article was published in these columns about reaming hydraulic cylinders in duralumin and eliminating grinding and honing by using a non-relieved tungsten-carbide tipped reamer.

I had not thought of using a machine reamer without relief. This was a new idea. It was so conventional to relieve our reamers, we had always done so, going to much bother to measure across the sharp cutting edges within a tenth or two, estimating the amount it would cut up to this size.

We used to encounter trouble in grinding a reamer which would give a definite "not go and go" for plus zero, minus five-tenths and last for a run of 3,000 or more in cast iron, steel, or even gun metal.

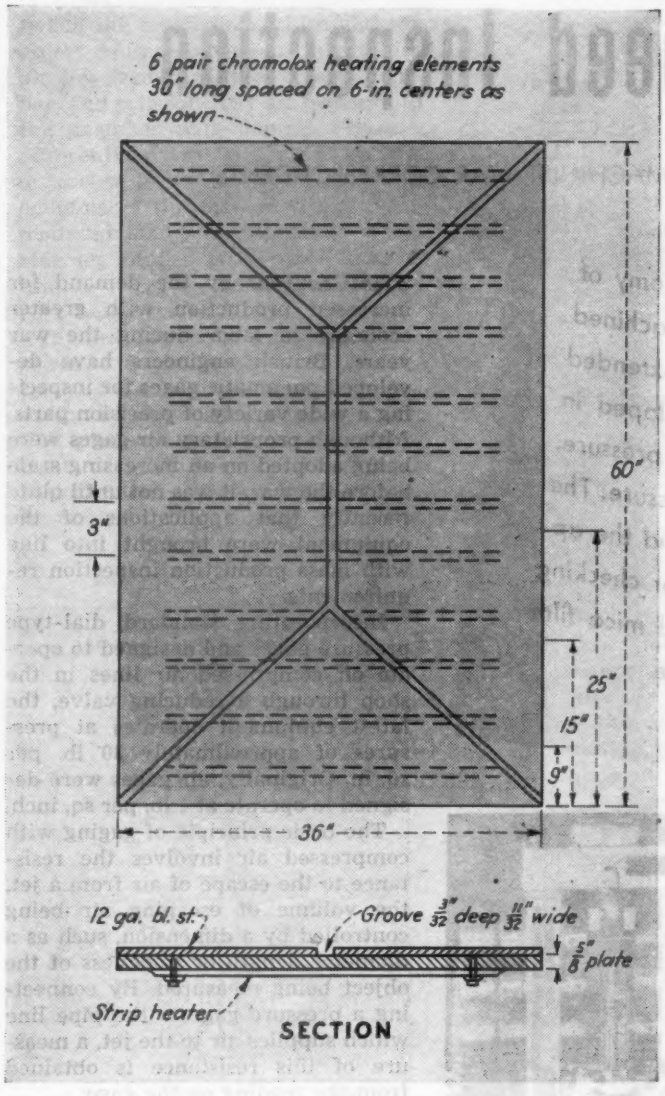
An old end mill, which had become very shallow in the flutes, was ground to a diameter of 0.500, and with a short lead of about 1/16 in. at 30 deg., and well backed off. The remainder of the end mill, now a reamer, was left with the plain cylindrical grind, the smoother the finish the better. Using this to ream different materials, a really high finish, polished or, more accurately, planished hole, was obtained. Cutting was free, the reamer was not tight to feed out. A thorough test was given with various feeds, speeds and stock removal in all kinds of material without poor results.

The reaction was that this idea would be satisfactory for a machine reamer, because it gave a superb finish, was easy to grind and cut a hole almost to the perfect size of the reamer. While a 0.500 in. gage could be pushed through by hand, a gage two-tenths smaller went through freely. This appeared too good to be true, because it had not been tried on a long production run and it might not stand up, the friction of the planishing action might cause quick wear.

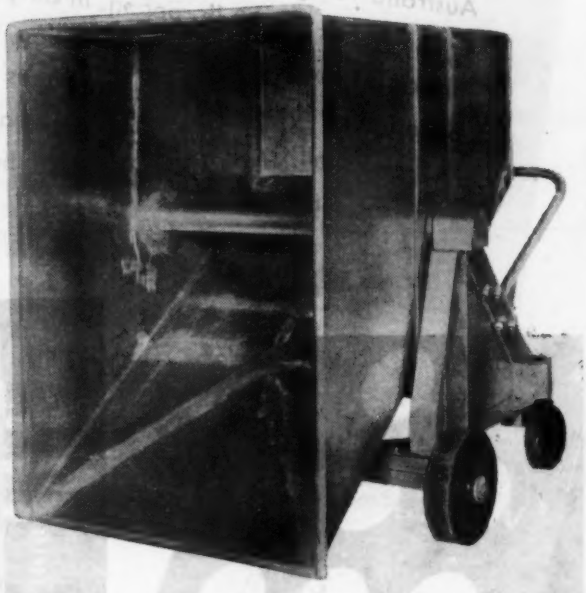
The original production run was on phosphor-bronze pump gears. The first 500 saw a drop of two-tenths in size, measured by turning a plug gage a neat fit in the bore and checking the plug. The finish in every gear was abnormally high, very accurate, there was practically no bellmouth effect. It was thought that the parallel section of the reamer had worn, but a check proved only an immeasurable difference. The lead had dulled, leaving slightly more metal to planish, resulting in a decrease in size. After sharpening the lead, the reamer cut the original dimension and reamed the next 500 with the same result.

Further experiments, with different materials, yielded much the same success. One inch diameter is the largest tried and it seems to indicate that the larger the diameter the less the opportunity for success, although one inch was quite satisfactory. A water-soluble oil proved ideal.

A development of this idea has the important feature of converting old end mills into reamers. Sometimes they are not long enough, but more often they are. Shallow flutes do not make any difference because all of the cutting is done on the lead and most chips travel ahead of the tool.



The buggy, below, consists of aluminum sheets, cut and trimmed to size, then clamped in the jig and fully welded. A five percent silicon-aluminum shielded arc electrode in 1/8 and 5/32 in. sizes is used for this portion of the job. The jig, left, constructed of 5/8-in. steel plate, is grooved along the surface which falls immediately under the seam of the buggy units. When welding the butt joints in the 1/8-in. aluminum sheet structure the grooves act as a back-up and give a reinforced weld section on the opposite side. Electric space heaters located in the reverse side of the jig are thermostatically controlled, heating the work so that penetration is effected without distorting the aluminum sheet and the previous job of grinding off excess weld metal is eliminated



Heated Jig Prevents Distortion

ROY E. WILLIAMS, WELDING ENGINEER, THE LINCOLN ELECTRIC COMPANY

IN THE FABRICATION of aluminum buggies for conveying nitrocotton in one of the country's largest powder-producing plants, the body of the welded structure, made of ⅛-in. 52-S aluminum sheet, became distorted, and weld penetration on butt joints was difficult to control.

In analyzing this problem, welding engineers decided upon a method of heating the work through special thermostatically controlled jigs. By means of space heaters, which are an integral part of the jig, a temperature of from 125 to 225 F. could be consistently maintained, thus avoiding excessive build-up of aluminum weld metal and allowing full penetration of the butt joints.

A center stiffener band is also welded in the same jig after the main body parts have been fabricated. Full-size fillet welds were used in fusing the center-stiffener to the body, with two passes of the electrode.

Material used in the lid handle is 1¼-in. by ⅛-in. aluminum strips and 1¼-in. diameter tubing of the same material with 3/16-in. wall thickness. The handle is manually welded directly to the cover plate without the use of jigs.

The framework comprising the base of the structure is made of SAE 1020 steel, cut, formed and welded with mild steel electrode. Parts are first tacked then manually arc welded as a bench job with fillet welds predominating.

This particular job was the first aluminum welding work ever done in the plant of The Day Company. Lincoln Electric equipment and electrodes were used.

Air Gages Speed Inspection

BY W. J. HARGEST, AMERICAN MACHINIST WAR CORRESPONDENT

DEMANDS in Britain for greater economy of labor and faster inspection of precision machined parts gave impetus to improvement and extended use of pneumatic gages, originally developed in Australia to operate at 1 lb. per sq. in pressure. British gages use 30 lb. per sq. in air pressure. The principles involved in their operation, and the application of these principles to gages for checking 20-mm. shell, cartridge case caps, and mica film thickness are described here

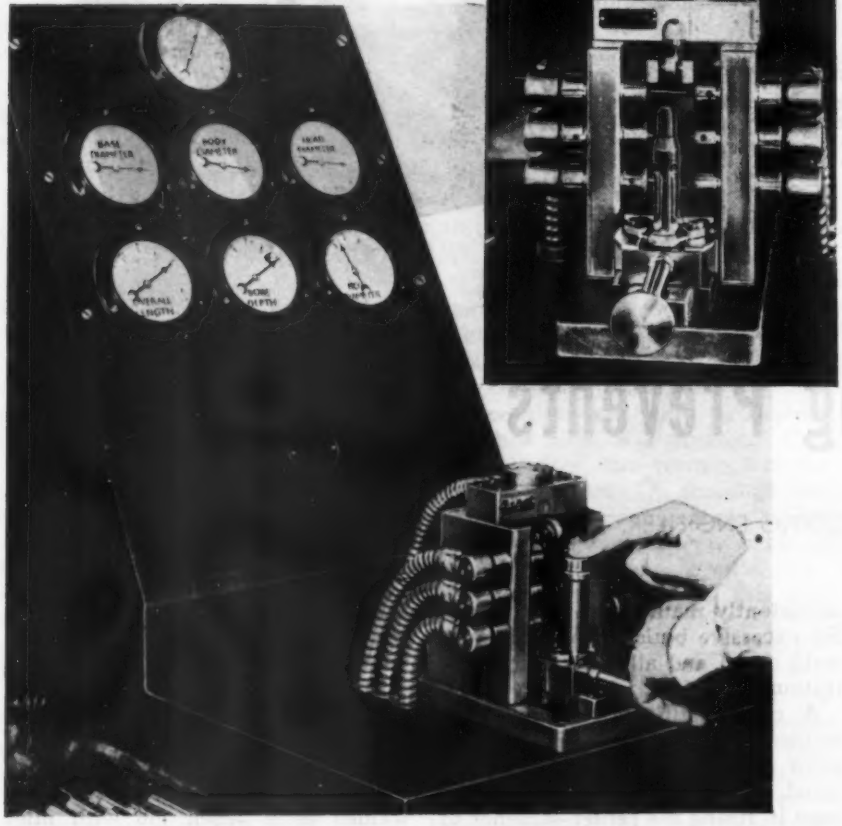


Fig. 1—Accuracy, speed and simplified operation feature air-operated gages. This unit checks six dimensions of a 20-mm. shell in one operation. Accuracy of closest reading is plus or minus 0.0002 in. In the closeup, the loading spindle is in the withdrawn position. The shell is inserted over the spindle and is pushed back between the gaging heads. Instantaneous readings show whether the dimensions are within specified limits

STIMULATED by the demand for increased production with greater economy in labor during the war years, British engineers have developed pneumatic gages for inspecting a wide variety of precision parts. Although proprietary air gages were being adopted on an increasing scale before the war, it was not until quite recently that applications of the equipment were brought into line with mass production inspection requirements.

Incorporating standard dial-type pressure gages and designed to operate off compressed air lines in the shop through a reducing valve, the latest equipment operates at pressures of approximately 30 lb. per sq. in. Originally, air gages were designed to operate at 1 lb. per sq. inch.

The basic principle of gaging with compressed air involves the resistance to the escape of air from a jet, the volume of escaping air being controlled by a dimension, such as a diameter, length or thickness of the object being measured. By connecting a pressure gage to the pipe line which supplies air to the jet, a measure of this resistance is obtained from the reading on the gage.

As dimensions of individual objects vary, the resistance to escaping air either increases or decreases, and the reading of the pressure gage correspondingly rises or falls. Air is supplied to the jet from a reservoir in which the pressure is maintained at a constant level above that of the surrounding atmosphere.

In the low pressure system, a constant pressure is maintained in the reservoir by a column of water about 20 in. high. Restriction jets limit the maximum amount of air delivered by the air line. If pressure in the reservoir exceeds that of the atmosphere plus the pressure exerted by the column of water, air escapes from the reservoir and bubbles through the water.

Flow of air at a pressure of about 1 lb. per sq. in. is controlled by an orifice after entering the intermediate chamber. From this chamber, the air escapes to the atmosphere through a small gap between the measuring jet, or orifice, and the surface of the object being meas-

ured. Variations in the distance between the measuring orifice and the object causes changes in the rate of air flow from the intermediate chamber, and consequently air pressure in the chamber will change. Pressure differentials are measured by the difference in water levels in the two columns of the manometer. A scale mounted alongside the small diameter leg of the manometer is calibrated to give dimensions of the part being gaged.

In the alternate equipment, air pressure in the reservoir is maintained constant, usually at 30 lb. per sq. in., by a precision reducing valve. The pressure is maintained within limits of ½ lb. per sq. in. over wide variations of flow. Air passes to the measuring orifice through a control orifice in a fine regulating valve. Pressure changes in the pipe between the control and measuring orifices are recorded by a standard Bourdon pressure gage. A graduated scale is calibrated to give the reading of the dimension being gaged. Tolerances or limits are also marked on the scales.

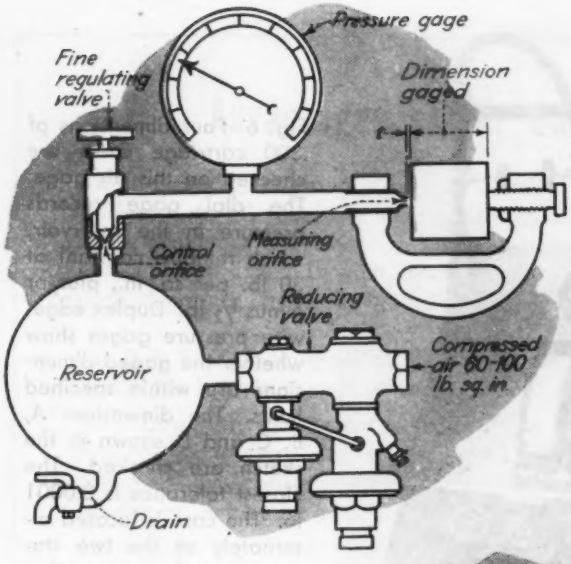


Fig. 2—Maintaining air pressure at 30 lb. per sq. in., the recently developed gages operate off compressed air lines through a reducing valve. Pressure changes vary with the distance *t* in the pipe between the control and measuring orifices, and are recorded by a standard Bourdon pressure gage

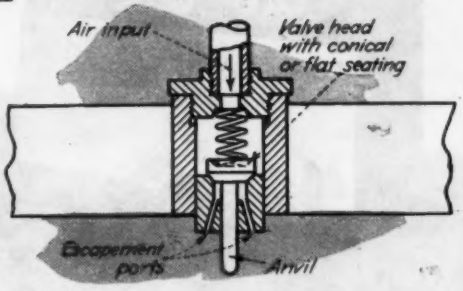


Fig. 3—Some air gages incorporate an escapement valve which is operated by a measuring anvil like that of a mechanical gage or optical comparator

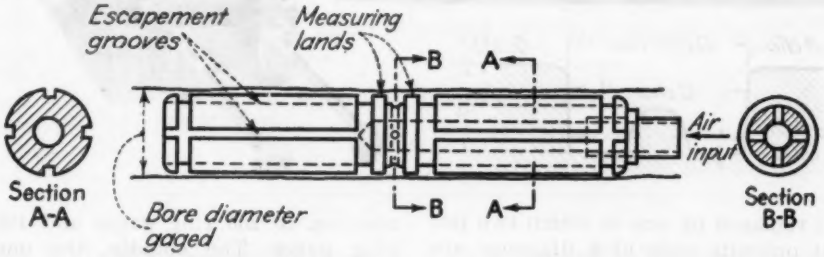


Fig. 4—Hollow plugs with escapement lands and grooves are used for measuring internal diameters. The size of the bore determines the volume of escaping air. Changes in volume cause pressure changes which are read on pressure gages appropriately calibrated in lineal dimensions

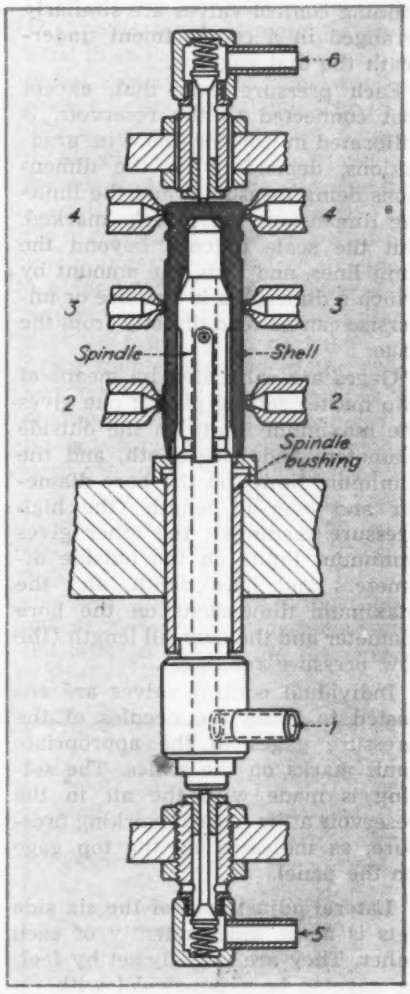


Fig. 5—Arrangement of the gaging points is shown schematically. A 20-mm. shell is checked for bore diameter, depth of bore, over-all length, and external diameter at three points. Direct impingement jets, an escapement valve and a hollow plug with air escapement lands are employed

A suitable choice of control and measuring orifice sizes permits a wide variation in sensitivity and range of measurement. Size of the control orifice in the high-pressure equipment can be adjusted by means of the fine regulating valve.

The measuring orifice can be adapted to many different types of measurement, either in the form of a direct impingement jet or indirectly as an escapement valve operated by a measuring anvil like that of a mechanical or optical comparator gage.

A gaging unit of the type shown in Fig. 4 can be used for internal measurements. Air enters the bore through a plug and escapes to the atmosphere over two narrow circumferential lands and along grooves in the surface of the plug. The diameter of the lands is slightly less than the remainder of the plug. Space between the periphery of the lands and the surface of the bore determines the rate at which the air will escape, and the pressure is recorded on the calibrated pressure gage.

This arrangement gives a measure of the average diameter of the bore on a section through the bore in the region of the measuring lands. If ovality is to be determined, the arrangement of circumferential lands

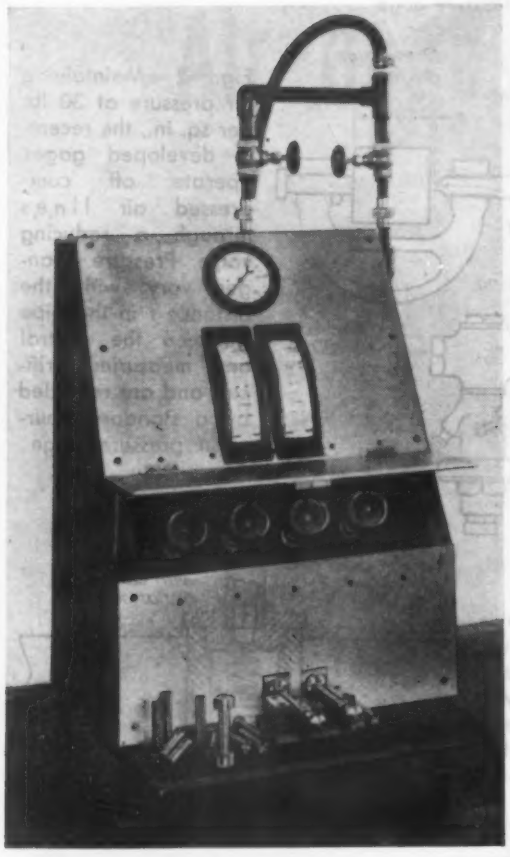
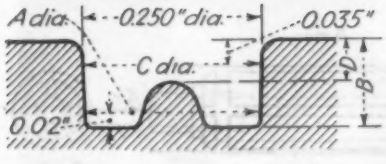
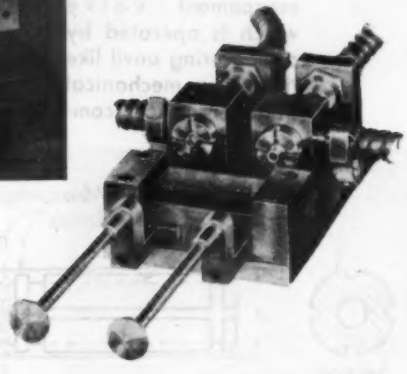


Fig. 6—Four dimensions of .300 cartridge cases are checked on this air gage. The dial gage records pressure in the reservoir, which remains constant at 30 lb. per sq. in., plus or minus ½ lb. Duplex edgewise pressure gages show whether the gaged dimensions are within specified limits. The dimensions *A*, *B*, *C* and *D* shown in the sketch are checked. The closest tolerance is 0.0001 in. The case is located alternately at the two stations by the retractable rods shown in the close-up view





is replaced by one in which two jets at opposite ends of a diameter are brought out to the surface of the plug. A similar method is also used for large bores.

Several measuring points, internal or external, can be operated from the one constant-pressure air reservoir, separate control orifices and pressure gages being fitted in the supply pipes for each measuring orifice. The high-pressure system with its relatively unlimited air supply and only one reducing valve is particularly well adapted for this type of multiple-measuring unit.

Gaging 20-mm. Shells

Six dimensions of a 20-mm. shell are checked simultaneously by the gage shown in Fig. 1. These are the three external diameters, the bore diameter, the depth of bore, and the over-all length. Over a 12-month period, this gage has been used by relatively inexperienced operators to check 4,500,000 shells at an average rate of 900 per hr. Compared with previous methods, it is estimated the gage has saved 16,000 man-hours, in addition to 250 ring gages and 120 plug gages. The spindle, the one wearing part, is good for 1,000,000 shells and can then be reclaimed by hard chrome plating.

With the sliding block against the front stop, the shell is placed on the gage spindle and pushed down so the closed end of the bore bears against the spindle nose. The block is then pushed against the back stop, bringing the shell between the six side jets which gage the external diameters. Since compressed air enters the shell bore through the radial orifice in the spindle, the operator must hold the shell on the spindle to cope with the pressure. As the sliding block is pushed into gaging position between the jets, the base of the shell, which is uppermost, comes in contact with a retaining spring. The shell is forced downwards, depressing the spindle against spring pressure until the open end of the shell engages the face of the cover cap on the spindle bushing fixed in the sliding block.

At the same time, a roller projecting through a slot in the spring comes into contact with the base of the shell. This raises a pivoted lever in which the roller is mounted. The amount of rise depends on the shell's over-all length. In rising, the lever actuates an escapement valve and the ensuing flow of air gives a measure of the length of the shell. The lower end of the spring-loaded spindle also bears against the stem of another escapement valve. Since the extent to which the spindle is depressed will depend on the depth of the bore, this dimension is measured by the flow of air through this valve.

Each jet and valve is connected by flexible and solid tubing to a single constant-pressure reservoir. A dial-type pressure gage and an adjustable control valve—as the variable orifice—are fitted in each line of tubing. Gages are arranged symmetrically on the panel and knobs of corresponding control valves are similarly arranged in a compartment underneath the dial gages.

Each pressure gage dial, except that connected to the reservoir, is calibrated in 0.001 or 0.0005 in. graduations, depending on the dimensions being measured, and the limiting dimensions are clearly marked. But the scale extends beyond the limit lines, and thus, the amount by which a dimension is oversize or undersize can be read directly from the gage.

Gages are calibrated by means of two master setting pieces: one gives the maximum limits on the outside diameters and bore depth, and the minimum limits on the bore diameter and over-all length (the high pressure readings); the other gives minimum limits on the outside diameters and bore depth, and the maximum dimensions on the bore diameter and the over-all length (the low pressure readings).

Individual control valves are adjusted to bring the needles of the pressure gages to the appropriate limit marks on the scales. The setting is made with the air in the reservoir at its normal working pressure, as indicated by the top gage on the panel.

Lateral adjustment of the six side jets is made independently of each other. They are initially set by feeler gage to be symmetrical with respect to the axis of the spindle. When they are correctly set, there is a clearance of about 0.001 to 0.003 in. between each jet nozzle and the part to be measured. The shell is approved if all pointers lie between the limit marks; otherwise, the shell is rejected.

The speed of response of pressure

gages is rapid enough to permit inspection of 1,000 shells per hr. The accuracy of the readings is equivalent to plus or minus 0.0002 in. on external and internal diameters and over-all length, and plus or minus 0.0005 in. on bore depth. Under normal conditions, this pressure gaging unit consumes an average of 8 cu. ft. of free air per minute.

Measuring .303 Cap Chambers

Another type of British multiple-gaging unit has been developed for measuring the dimensions of the cap chambers of .303 cartridge cases. The unit is shown in Fig. 6 & 7. Dimensions *A*, *B*, *C*, and *D* are those to be measured.

Two gaging positions are provided, the left-hand station for measuring dimensions *A* and *B*, and the right-hand station for dimensions *C* and *D*. The internal diameter is measured in each instance by circumferential escapement of compressed air over a measuring land. The land, 0.03 in. wide, is formed on a gaging nipple which is inserted to a predetermined distance inside the chamber.

At the left-hand station, the nipple is carried on a spring-loaded hollow plunger which is free to slide in a guide bushing in the frame of the fixture. The cartridge case is placed with the cap chamber over the measuring nipple, the end of the nipple bearing against the bottom of the chamber. The cartridge case is then pushed back (the plunger moving with it) until the end face of the case bears against the datum face of the bushing. As the plunger moves back, compressed air is released automatically, flows into the cap chamber through the plunger bore, and escapes to the atmosphere over the land on the nipple. Pressure of air in the pipe leading to the bore of the plunger will then depend on the diameter *A* of the cap chamber in the plane of the land at 0.02 in. from the bottom of the chamber. This pressure—and measurement of dimension *A*—is registered on one of two scales on the left-hand duplex edgewise gage shown on the panel in Fig. 6.

For checking dimension *B*, the rear end of the nipple plunger at the left-hand station bears against the stem of a poppet escapement valve. The extent to which the valve is opened will depend on movement of the plunger and, consequently, on the depth of the cap chamber. Pressure of controlled air supply to this valve is indicated on the second calibrated scale of the left-hand duplex edgewise pressure gage, and this gives a measure of the depth of the chamber.

Dimensions *C* and *D* are checked at the right-hand station. The gaging nipple is fixed in relation to the guide bushing so that the leading edge of the measuring land is 0.035 in. in front of the datum face of the bushing. A hollow plunger, the forward end of which is especially shaped and drilled, is a good sliding fit in the bushing, and terminates in a solid gaging face. When the face of

Advantages of Air Gaging

While British engineers do not suggest that air gaging is applicable to all jobs, nor necessarily the easy answer to all gaging problems, experience so far has proved that it has interesting possibilities. It also offers a number of advantages when rationally applied, including the following:

1. It is flexible in application and can be used for checking dimensions having close tolerances.
2. Maintenance costs are relatively low since there are few working parts requiring replacement. With the direct impingement jet, there is no physical contact between the jet and the object being measured.
3. Inexperienced operators can be taught quickly to use the gages.
4. Use of the gages is not subjected to the personal appreciation of "feel" associated with some other types.
5. The gages can be used for comparative checks, and give direct readings for size in contrast with "go" and "not go" indications, when the pressure scales are appropriately calibrated. Therefore, pneumatic gages can be applied in normal methods of statistical quality control.
6. When measurements are made with the aid of poppet or sleeve escapement valves having metal stems for direct contact with the object being measured, the units are similar to mechanical comparators.
7. Several dimensions can be gaged simultaneously at one measuring station.

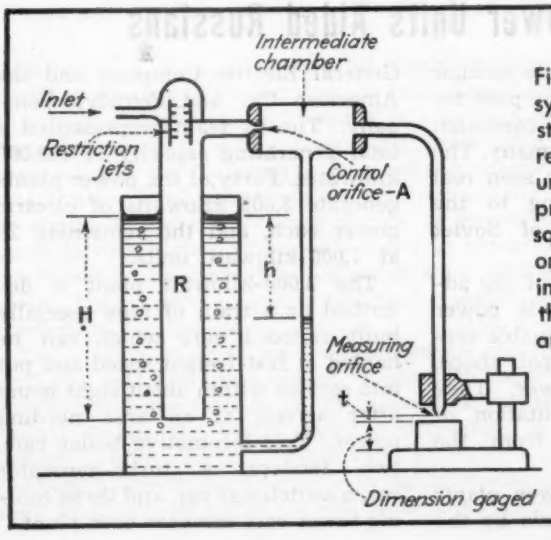


Fig. 7 — Low-pressure system maintains constant pressure in the reservoir *R* by a column of water *H*. Air pressure of 1 lb. per sq. in. is controlled by orifice A. Variations in distance *t* between the measuring orifice and object changes the air flow rate

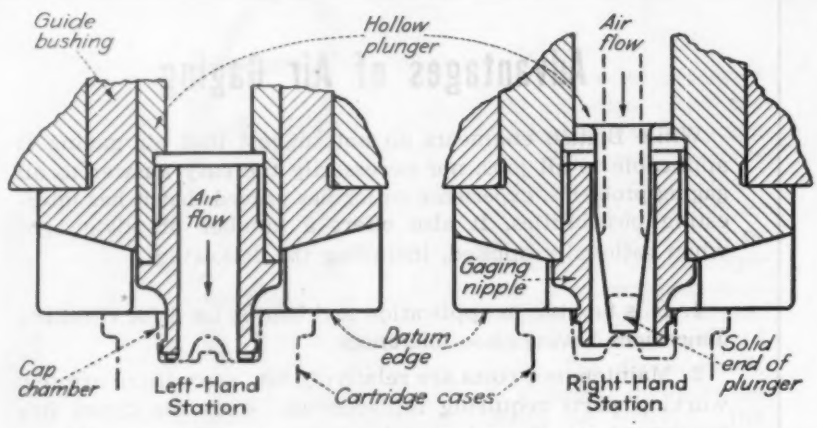


Fig. 8—The two stations of the air gage shown in Fig. 6 are shown schematically. When gaging the cap dimensions of the cartridge cases, the volume of air passing the gaging points is determined by escapement lands and poppet-type escapement valves. Air consumption is low because the jets function only when the cases are in gaging position

contact with the face of the guide bushing, the forward end of the plunger engages the tip of the cap chamber anvil and is forced backwards against spring pressure. Air supply for measuring diameter *C* is thereby released through the plunger bore into the cap chamber, whence it escapes over the measuring land. Simultaneously, the rear end of the plunger engages the stem of a poppet valve, which is finally opened by an amount depending on the depth of the anvil tip from the face of the case, that is, depth *D*.

Dimensions *C* and *D* are registered independently on the scales of the right-hand duplex edgewise gage, which is calibrated in 0.0001 in. and 0.001 in. graduations, respectively, for diameter and depth dimensions. During measurement the case is located alternately at the two stations by retractable rods. Adjustment of gaging points is made with maximum and minimum setting pieces, individual control valves being provided for both the escapement nipples and the two poppet valves.

A feature of the unit is the low consumption of air, due mainly to the arrangement whereby air is passing through the jets only while a cartridge case is in gaging position. In the latest model, developed within recent months for gaging 20-mm. cartridge cases, sleeve valves are used in place of poppet valves, but the principle is the same.

Gaging Thin Mica Films

Quite a different problem was faced in measuring films of mica ranging from 0.0008 to 0.0032 in. thick. The gage consists of the usual control valve and pressure gage, a constant-pressure air reservoir, and two direct-impingement jets. One jet is mounted vertically above the platform at the front of the instrument, and the other below it, the lower jet projecting through a hole in the platform with its face a few thousandths of an inch above the surface. The upper jet unit is adjustable for different thicknesses of film. When the instrument is set, the film is passed by hand between the two jets, the thickness being recorded on the dial gage, each division on the scale corresponding to 0.0001 in. When measured, the films are graded into different containers according to their dimensions.

The accuracy of the unit is plus or minus 0.000025 in. The response of the gage to changes in pressure (that is thickness) is rapid, and it is adaptable for continuous measurement.

Fig. 9—Thin mica films are checked for thickness by this gage which employs two air jets placed in line vertically. The accuracy of the gage is plus or minus 0.000025 in. The inspection rate is 30 films per minute

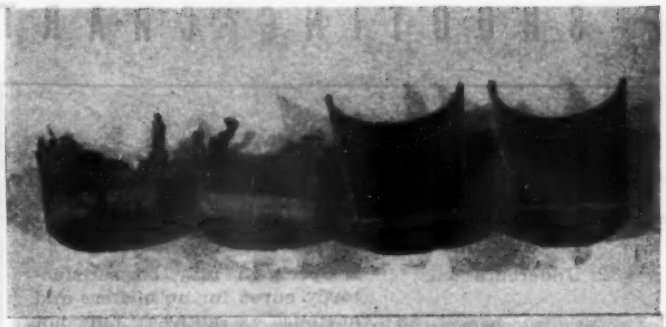
Mobile Power Units Aided Russians

AMERICAN-BUILT mobile electric power trains helped set the pace for the smashing Russian campaign into the heart of Nazi Germany. The mobile power plants have seen real front-line duty, according to the Embassy of the Union of Soviet Socialistic Republics.

Following in the wake of the advancing Red Army, mobile power units have rendered invaluable service to tank and truck repair shops, supplying them with power. They assisted in swift rehabilitation of Russian cities retaken from the Nazis.

Sixty-three mobile power plants were supplied Soviet Russia by the General Electric Company and the American Car and Foundry Company. The 63 plants represented a total generating capacity of 143,000 kilowatts. Forty of the power plants generate 3,000 kilowatts of electric power each, and the remaining 23 at 1,000-kilowatt units.

The 3,000-kilowatt plant is described as a train of nine specially built railroad cars which can be hauled at fast-freight speed and put into service within about eight hours after arrival at an area needing power. Two locomotive boiler cars, two tenders, a turbo-generator car, a switchgear car, and three cooling tower cars compose each plant.



Cupped parts above were preheated and formed in the same mold to illustrate the advantage of high-frequency heating. Those to the left were preheated in an oven and failed because the outer skin of the preform had precured. Those to the right were preheated by high-frequency induction and formed perfect moldings. The preform for the handle molding, far right, is formed to approximate the rough contour of the piece, preventing excessive waste

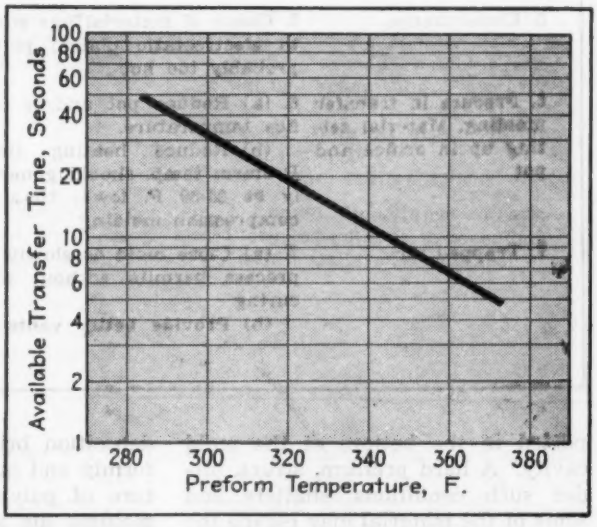
Good Preforming and Preheating Methods Insure Satisfactory Molding

BY D. M. BUCHANAN, CHIEF DEVELOPMENT ENGINEER, THE BAKELITE CORPORATION

Selection of a preforming and preheating method is dependent on the variables of designs, molding compositions and economics. These factors are discussed in this article, the last of the series

PREPARATION of thermosetting plastic materials before molding consists of preforming the bulk plastic material to the rough shape of the mold cavity to provide a convenient form for handling, and subsequently preheating the preform. Preforms for compression-molded articles with a small ratio of volume to surface area are usually tabletted in simple flat shapes; round, square or rectangular. For parts having higher ratios of volume to exposed surface, the tablet is die-formed to the rough mass of the finished piece. This is done to assure sufficient material within the confines of the die space.

The density of preforms for compression molding varies with the part and mold design. Parts with inserts require a stiffer and more dense tablet to assist in supporting the inserts during the initial molding pressures. A medium density preform having a bulk ratio of 3.5 to 1 (3.5 times the bulk of the finished piece) is preferred under conditions that permit the tablet to be struck before it is fully sup-



Points on the line indicate available time for transfering preforms to molds, without loss of flow, when heated by high-frequency to the temperature indicated. Increasing the temperature of the preform in the high-frequency machine decreases the time available for transfer

TROUBLE SHOOTING CHART

ARCING

CAUSE	REMEDY
1. Preform too thin	1. Keep preform thickness above ¼ in.
2. Plates too close together	2. Separate plates
3. Too wide an air gap	3. Keep air gap below ¼ in.
4. Sharp edges on connections and electrostatic plates	4. Electrostatic plates should be smooth and have rounded edges
5. Material partially conducting	5. Change material. Presence of conducting particles or filler such as 15 percent graphite will cause arcing
6. Moisture condensing on preform forming conducting parts	6. See Remedy No. 7 under "Internal Blisters"
7. Voltage too high at electrostatic plates	7. Reduce voltage at electrostatic plates by operation of H.F. generator at maximum available frequency. Frequency above eight megacycles is desirable

MOLD NOT FILLING

1. Insufficient pressure	1. Don't expect more than 60 percent pressure reduction. It may be less in transfer molding and with some materials
2. Under-heating	2. See Remedy No. 2 under "Internal Blisters"
3. Over-heating	3. (a) Reduce heating time (b) Transfer preform to mold more quickly
4. Non-uniform heating	4. See Remedy No. 3 under "Internal Blisters"
5. Undercharge	5. Check if material has stuck to electrostatic plates; plates probably too hot
6. Precure in transfer molding. Material setting up in orifice and pot	6. (a) Reduce pot and/or orifice temperature. (b) Reduce heating time. Preform temp. should generally be 25-50 F. lower than in compression molding
7. Trapped air	7. (a) Close mold as slowly as process permits without precuring (b) Provide better vents

SURFACE BLISTERS

CAUSE	REMEDY
1. Cold mold	1. Increase molding temperature
2. Undercure	2. Specimen may be satisfactorily cured for no blisters and acetone extractives, but not sufficiently for full development of gloss. Increase cure time
3. Precure due to overheating	3. (a) Reduce heating time (b) Cool electrostatic plates which may be precuring surface of preform
4. Use of multiple preforms	4. Substitute single preform

POOR GLOSS

1. Cold mold	1. Increase molding temperature
2. Undercure	2. Increase cure time
3. Excessive volatiles	3. (a) Increase heating cycle to maximum allowable without precuring or loss of flow (b) Fast releases (c) Pre-dry material
4. Moisture condensing on electrostatic plates and dropping back on preform	4. Encountered with large preforms. See Remedy No. 7 under "Internal Blisters"
5. Excessive volatiles. Condensation moisture on preform	5. Encountered mostly with large preforms. See Remedy No. 7 under "Internal Blisters"
6. Slow releases	6. (a) Do not release and increase cure time (b) Fast releases

STICKING

1. Cold mold; undercure	1. Increase molding temperature
2. Non-uniform heating	2. See Remedy No. 3 under "Internal Blisters"
3. Excessive volatiles. Condensation moisture on preform	3. Encountered with large preforms. See Remedy No. 7 under "Internal Blisters"

ported in the bottom of the mold cavity. A hard preform, struck under such conditions, shatters and some of the material may escape the confines of the mold.

Preforms for transfer-molded parts are tabletted in simple shapes suited to the loading chamber of the machine.

Preheating of the materials before deposition brings the material uniformly and quickly to the temperature of polymerization outside the molding die and press. The allowable heating and handling time is limited by the polymerization rate of the molding composition. It is necessary to heat the mass to the molding temperature and transfer to the mold without decreasing the flow properties of the composition.

Preheating or tempering of molding materials prior to the pressing operation is done to improve the flow of the material in the mold, accelerate the speed of mold closure and cure, and reduce the closing pressures.

A common means for preheating is the double steam plate in which a

FOR PLASTIC MOLDINGS

MOTTLE ON LIGHT

CAUSE	REMEDY
1. Excessive volatiles. Condensation moisture on preform	1. See Remedy No. 7 under "Internal Blisters"

PIN DISTORTION OR BREAKAGE

1. Under-heating	1. See Remedy No. 2 under "Internal Blisters"
2. Over-heating. Precure	2. See Remedy No. 4 under "Internal Blisters"

INTERNAL BLISTERS

1. Undercure	1. (a) Increase cure time (b) Increase molding temperature
2. Under-heating	2. (a) Increase power input (b) Check tuning during heating cycle. If machine cannot be kept in tune during cycle, it is preferable to have it *in tune at end* rather than at beginning of heating cycle (c) Increase heatronic heating time up to 45-75 sec., depending on material
3. Non-uniform heating	3. (a) Be sure electrostatic plates are flat and equally distant apart (b) Be sure air-gap between preform and electrostatic plate is uniform or there is good contact between preform and plate (c) Do not allow preform to distort unevenly during heating (d) Elecrostatic plates too heavy and cold, absorbing heat at surface. Keep warm (e) Check preform for: (1) Variable thickness; (2) non-uniform density; (3) badly crumbled edges (f) Be sure distance between electrostatic plates is no greater than length, width, or diameter preform. High frequency field distorted (g) Modification of plate design for very large preforms
4. Gassing due to overheating	4. (a) Reduce heating time (b) Transfer preform to mold more quickly

INTERNAL BLISTERS (Continued)

CAUSE	REMEDY
5. Use of multiple preforms in molding having slight flow	5. Material sensitive to precure and over-heating. Apply same remedy as 4 (a) and 4 (b)
6. Excessive volatiles	6. (a) Increase heating cycle to maximum allowable without precuring or loss of flow (b) Fast releases (c) Pre-dry material
7. Moisture condensing on electrostatic plates; improper evaporation from preform surface	7. Encountered mostly with with large preforms. (a) Pre-dry material (b) Keep electrostatic plates warm (c) Use ⅛ in. air gap (b) Use porous or screen-type electrostatic plates (e) Mount applicator in ventilated oven or heat externally with infra-red ray lamps
8. Slow releases	8. (a) Do not release and increase cure time (b) Release as fast as possible after mold has closed

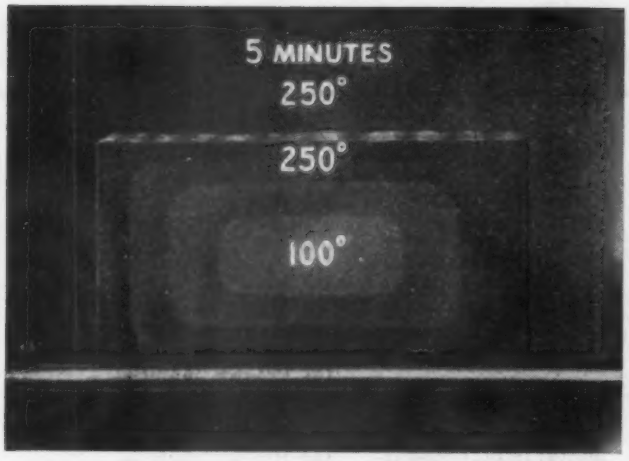
MATERIAL NOT HEATING

1. Machine capacity too low	1. It is desirable that high-frequency generator have an output capacity of 2.5 kw. per lb. phenolic-cellulose fiber to heat to 300-350 F. within 60 sec.
2. Material very dry and good electrically	2. (a) Increase machine capacity (b) Split preform charge. Use two high-frequency machines
3. Material changes greatly in electrical properties on heating, putting H. F. machine out of tune	3. (a) Machine tuned too sharply. Broad tuning range desired (b) Check tuning during heating cyce. If machine cannot be kept in tune it is preferable to have it in tune at end rather than at beginning of heating cycle (c) Call radio engineer
4. Machine not in tune. Preform size and charge changed such that outside capacitance is too large or too small for available tuning range	4. Change inductance or auxiliary capacitance in secondary circuit. Call radio engineer

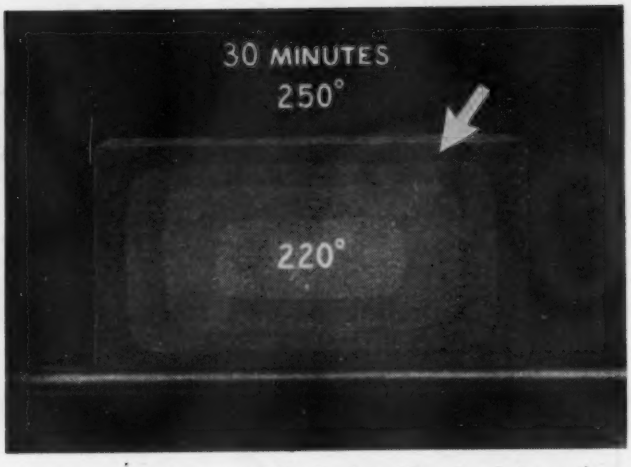
layer of preforms is placed between two steam-heated plates. In such an arrangement, two or more mold charges may be placed, depending upon the over-all time cycle. Time required for preheating is from five minutes up, depending upon the temperature of the plates and the thickness and weight of the material in the charge.

Another means of preheating is an arrangement similar to a baker's oven in which the preforms may be placed by hand or conveyed through with a conveyor system.

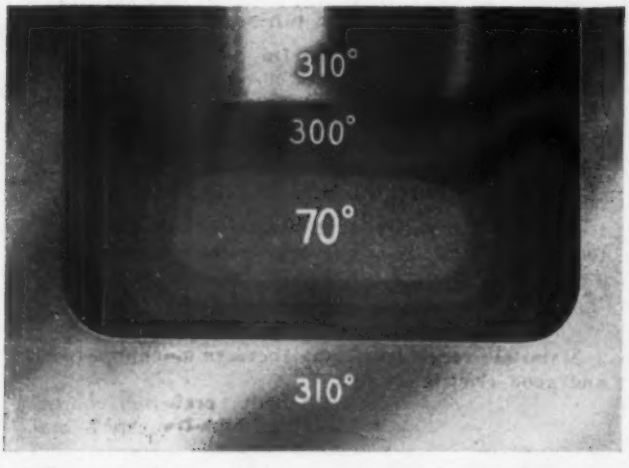
Both these methods, and any arrangements which operate on the principle of providing heat from an outside source, heat the material by conduction. Although many advantages—low initial cost, low maintenance cost and simplicity of mechanism—are obtained by the use of conduction-heating equipment, the basic characteristics of the molding compounds resist extensive application of the method. Molding compositions are, in general, low in thermal conductivity. This characteristic causes the material to resist



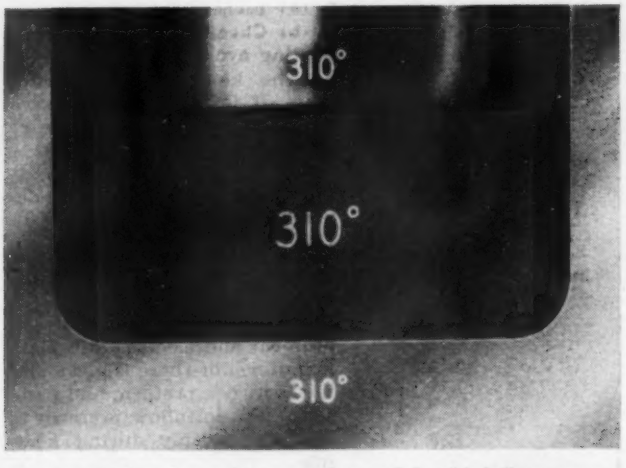
Preheating this preform for 5 min. at 250 F. oven temperature failed to bring the interior of the mass to molding temperature. When pressed, the molding will crumble because the material will not polymerize



Oven preheating at 250 F. for 30 min. brings the interior of the mass to molding temperature, but the time required for heating permits the surface of the molding composition to precure and become hard



A large preform, which has been preheated by conduction to the proper molding temperature at the surface, will have an infusible core of underheated material that will not become plastic under pressure



Preforms that have been preheated by high-frequency electrostatic fields are uniform in temperature regardless of thickness. Surface temperatures are close indicators of temperature throughout the mass

heat absorption and therefore, a preform so heated is considerably hotter at and immediately adjacent to the surface than it is inside the tablet.

Although the temperature of polymerization may have a reasonable tolerance, the rate of polymerization will be speeded if the temperature is raised appreciably. Thus, if a preform of thick section (over ¾ in.) is heated by conduction methods sufficiently to bring the surface to the polymerization temperature, the interior will be well below the proper temperature. If the preform is held in the preheating equipment for a length of time sufficient to bring the inside up to temperature, the surface sections will be polymerized and will not be moldable. This limits the molding of articles preheated by conduction methods to those which may be molded from preforms of less than ¾ in. thickness.

Large volume moldings of thermosetting compositions are facilitated by the use of high-frequency electrostatic equipment to preheat the material. Under the influence of an electrical field, the molecules of a non-conductive material become oriented so that the positive part of the molecular dipole is nearer the negative electrode of the field and the negative part of the molecular dipole is nearer the positive electrode. When the electrical field is reversed, the molecules reverse their positions to conform to the change in electrical field. If this reversal occurs a million or more times per second, friction occurs between adjacent molecules with resultant dissipation in heat.

High-frequency, or heatronic, heating differs from conducted heat in that the source of heat is generated by hysteresis in the material itself and is not generated outside and conducted into the material being heated. The rate of temperature increase is equal throughout the material and, as each cyclic reversal is effective on each individual molecule, the time required for thermal conduction from molecule to molecule is entirely eliminated.

The even distribution of heat throughout the material increases the plasticity or flow characteristics of molding compositions and permits a reduction of 30 to 40 percent in molding presures. Wear on molds is decreased and problems connected with insert shearing and displacement are relieved. Moldings of 50 lb. or over are possible when the charge is heated by frequency induction.

Practical Ideas

HAVE YOU A PRACTICAL IDEA?... If so, send it in. Your idea will help other men, in other shops, who have a problem similar to yours. We pay for acceptable contributions prepared exclusively for this publication

Knife-Edge Shock Absorber Installed on Balancing Stand

BY JEANNE C. SPENCER, NAVAL AIR STATION, ALAMEDA

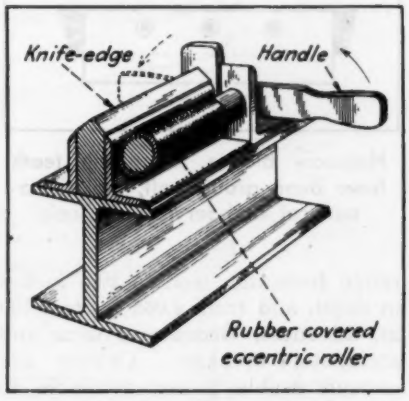
When heavy objects are placed on a balancing stand, damage to the knife edges is likely to occur because of inability to let the load down softly. These bumps injure the sharp edges or cause indentations in the mandrel supporting the load, both of which detract from the accuracy of balancing.

A means for cushioning this shock was adopted which takes the weight of the mandrel and the part to be checked off the knife-edges until operations are necessary.

Two knife-edges, parallel to each other, have rubber-covered rolls alongside of them. These rolls have their journals turned eccentric so that, when at their highest point, the rubber surfaces are above the knife-edges and any accidental descent of the load will do no damage. When the load is to be placed on the knife-edges, the handle on the eccentric shaft is turned and the roll dropped enough to permit the mandrel to roll freely.

When lead is tamped into the object being balanced, the rubber-covered rolls are raised to take the weight off the knife-edges so that damage will not occur to the sharp edges or the mandrel.

A shock absorber of this type is of great benefit where inexperienced personnel unknowingly cause accidents and protects a precision instrument which should always be in topmost condition: the danger of damage to the knife-edge and mandrel is minimized. Likewise, these rolls can be installed wherever this type of balancing machine is in use. It saves refacing caused by rough use. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



Shock-absorbing rolls prevent sudden application of the load to the sharp knife-edges and promote accuracy of balancing

Brass rollers are elevated above the knife-edges to receive the load; eccentric bearings permit lowering the load softly upon the knife-edges

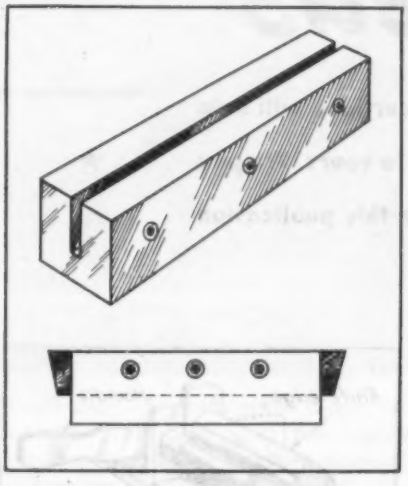
Broken Hacksaw Blades Make Excellent Parting Tools

BY W. J. PATAKY
New York Navy Yard

To avoid waste of material, parting or cutting-off tools are made as narrow as possible. To prevent binding, it is necessary to provide side rake. The combination of diminishing width, limited depth and the possibility of a long overhang do not permit very heavy cuts with safety.

Constant breakage of these thin blades has been an item of replacement expense which has been diminished by the substitution of broken hacksaw blades.

The large sizes of hacksaw blades



Hacksaw blades, after the teeth have been ground off, make economical and serviceable tools

range from one inch to two inches in depth and from 0.065 in. to 0.100 in. thickness. Because of wear and accidental breakage, there are enough usable pieces available to be made into parting tools by grinding off the teeth and making a chuck to hold them.

The chuck is a convenient piece of soft steel slotted deeply enough to permit a clamping plate to press against the blade. Setscrews in the side of the chuck support the blade and prevent the tool from backing away from the cut.

Because of the quality of steel in these saws, they give good service and are very economical. *Suggestion Submitted Under the Navy Employees' Suggestion Program.*

Power Hammer Stopped by Brake at Top of Stroke

BY ARTEM J. GAUTHIER
Oregon Shipbuilding Corporation

A power hammer seldom stops in the up position, because a brake or stop is not included in its design. Consequently, much time is lost in running the machine until the hammer is at its highest point.

This condition has been remedied by placing a pulley on the drive shaft to act as a brake drum and using a spring brake band about the pulley, but anchored to the frame. When the press is tripped, and as long as the foot is on the treadle, the brake is released while the hammer is in operation. As soon as the treadle is released, the crank turns to the top position at which point the brake is thrown into contact with the drum. A small compressed air cylinder opens the brake band when the operating throttle lever is thrown so that it works automatically with the operation of the hammer. Consequently, the hammer stops at the highest point of its stroke and there is no over-run or drift, permitting work to be removed from the dies. This is in contrast to the free-running condition when the hammer would have to be inched along until the head was away from the die. The work can be done in 75 percent of the previous time. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Braking the mainshaft of a power hammer stops the head at the highest point of the stroke, making production rapid because work can be placed in position at once

Leaks Exposed, Pipes Cleaned by Hot Water from Circulator

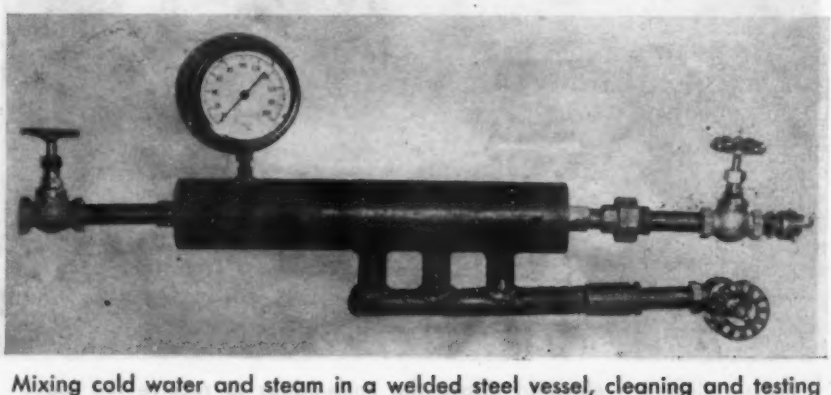
BY JOE THOMASO
Lake Washington Shipyards, Houghton, Wash.

For long life, freedom from repairs and dependable service on board ship, brass and copper pipe is used where seawater may be in contact with metal. Because of this fact, brazed joints of many kinds are necessary and every joint must be tested with hot water under pressure before going into service.

To provide hot water under pressure at points remote from a convenient source, a mixer has been made of a short length of large diameter pipe in the ends of which are welded heads with sockets for smaller diameter inlet and outlet pipes and at the side are several inlets connecting to a steam header made from a short length of small pipe. A steam gage is connected to the mixing tube to control inlet steam pressure so that it will not overcome the water pressure in the feedline.

The water inlet is connected to the plant water supply and the steam inlet to the steam main. A snap or bayonet connection is provided at the hot water outlet for hose leading to the pipe to be tested.

In practice, the cold water valve is opened first, then the steam valve is opened slowly to prevent the steam pressure from becoming too high. With the hot water hose connected to the pipe under test, the outlet valve is opened to permit a stream of hot water at almost boiling point temperature to flow. The hot water dissolves flux, washes out grease and removes dirt. Because water is more fluid as its tempera-



Mixing cold water and steam in a welded steel vessel, cleaning and testing pipe can be done in about a third of the time required by previous methods

ture increases and there is pressure behind the stream, minute leaks are discovered and quickly repaired.

This scheme may be utilized to heat large quantities of water quickly, the temperature being controlled by the water and steam inlet valves. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Sealed Bearings Regreased by Simple Bench Tool

BY R. FALVO
California Shipbuilding Corporation

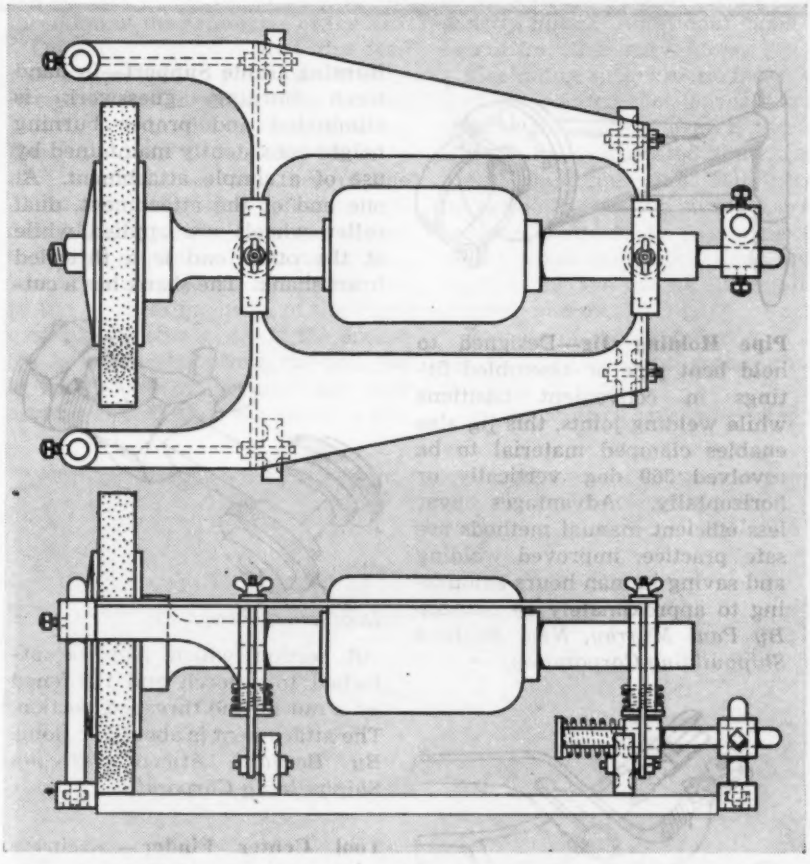
Sealed ball bearings contain lubricant which is expected to last for many years of active service. Yet, after a long period of use, these bearings are run dry.

Because of their construction, ordinary application of grease does not penetrate into the raceways; if the lubricant can be introduced under pressure, the space between the balls and raceways can be filled and the bearing will be ready for use with advantage in some other place.

For this purpose, a metal bar has a tapered hole bored in it: an inlet hole is drilled and tapped close to the bottom of the taper. In this hole there is a pressure grease fitting. A bail is fastened to the top of this body, and this bail is drilled and tapped for a screw having a handle and a conical end.

Sealed bearings needing lubricant are placed in the tapered recess in the block, the cone-point holddown is screwed down, and grease is pumped through the grease fitting fastened in the block

Bearings are inserted into the tapered hole, then the cone is screwed down until the bearing is held in position. Grease under pressure is pumped into the bearing until some excess appears on the free side of the races, which indicates that the bearing contains enough lubricant. With this outfit, serviceable bearings can be repacked quickly. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



Edge grinding is an easy job when the grinder is supported by a carriage provided with guide rolls to control the uniformity of cut

Adjustable Portable Grinder Reduces Operators Fatigue

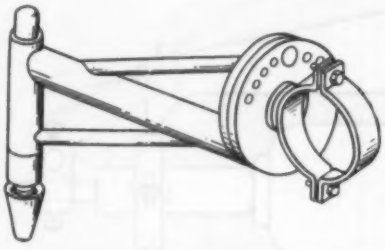
BY DALMAR H. PADGETT
Navy Yard, Mare Island

Steel plates in the "as received" condition have a coating of scale, if they have just been rolled, or a layer of rust, if they have been stored for some time in the steel yard. This layer must be removed. The best method for uncovering sound metal is grind the surfaces to be welded. The usual power-driven hand grinder is not only difficult to control, but requires much effort upon the operator's part to keep the abrasive wheel in contact with the plate.

For grinding the edges of steel plates, a carriage has been worked out which rolls upon the surface of the plate, but is guided by two rollers in contact with the edge to be ground and a spring-controlled roller bearing upon the back of the plate.

The grinder is mounted upon springs strong enough to hold the wheel out of contact with the plate when not in use. The rear guide wheel is adjustable for reasonable variations in the width of the plate, but its main purpose is to hold the abrasive wheel in a constant position along the length of the plate. With this carrier, there is little physical labor to move the grinder.

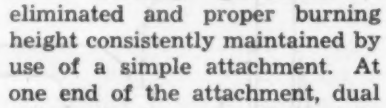
This portable-grinder carriage reduces operator fatigue and makes possible more uniform cuts. *Suggestion submitted under the Navy Employees' Suggestion Program.*



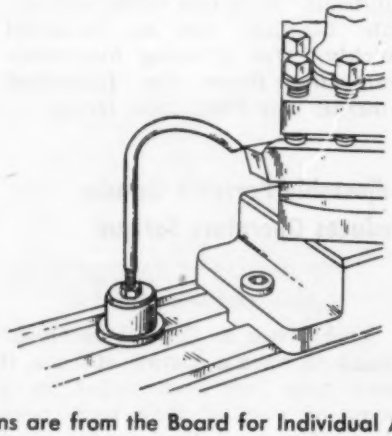
Pipe Holding Jig—Designed to hold bent pipe or assembled fittings in convenient positions while welding joints, this jig also enables clamped material to be revolved 360 deg. vertically or horizontally. Advantages over less efficient manual methods are safe practice, improved welding and saving in man hours amounting to approximately 50 percent. *By Paul Murray, New England Shipbuilding Corporation.*

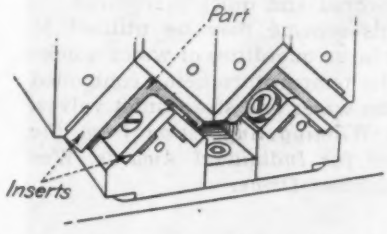
Hose Clamp Tool—Installation of open-type hose clamps has been substantially facilitated by modification of commercial-type water pump pliers. Additional parts used are a holder plate for the nut, a forked plate, and a retainer spring. The holder plate and forked plate are welded to the jaws of the water pump pliers, and the retainer spring attached with a screw. The hose clamp nut is placed in the holder plate, held securely by retainer spring, and the pliers adjusted to suit diameter of hose clamp. The jaws of the pliers are placed over the two wings of the hose clamp, and enough pressure applied to allow clamp screw to enter several threads in the nut. Right and left offset pliers may be made with same parts. *By H. A. Seyboth, Naval Air Station, San Diego.*

Burning Guide Support—In hand torch burning, guesswork is eliminated and proper burning height consistently maintained by use of a simple attachment. At one end of the attachment, dual roller wheels are applied while at the other end is a threaded brass shank. The shank has a cut-out section which may be attached to a torch and tightened by a nut on the threaded portion. The attachment is about 5 in. long. *By Bernard Atwood, Oregon Shipbuilding Corporation.*

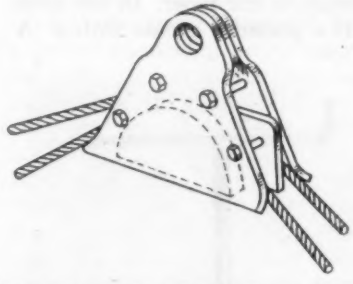


Tool Center Finder—Accurate setting of turret lathe tools may be accomplished by the use of a gooseneck rod fastened to a base. This unit is placed on the cross feed or turret bed and the tool point aligned with the gooseneck point, after which the tool is tightened. The gooseneck extends over the base enough to give accurate setting without guesswork. Prolonged tool life, reduced breakage and grinding time are made possible by this positive setting. *By Harold Davis, Glenn L. Martin-Nebraska Company.*





Joggle-Die Inserts—Conventional 90-deg. joggle forming dies had been made of tool steel, with individual dies comprising a full range of depth sizes. When a change in depth of the joggle was necessary, the die had to be reworked. Now, a die of hot-rolled steel is used, with tool-steel inserts of the required size being held in place with screws. To reduce the depth of the joggle, the insert is removed and the necessary number of shims inserted to bring the reinstalled insert to required depth. Grinding down the insert, when necessary, is accomplished more readily than reworking of the complete die. *By George P. Geary, Curtiss-Wright Corporation, St. Louis.*



Wire Rope Protector—To protect cable from rubbing, kinking, and breaking strands on heavy lifts, a wire rope protecting shackle was devised. The device incorporates two pieces of flat plate, about 16½ × 15 in., and between these another flat plate, 2¼ in. thick, in the shape of a semi-circle, is welded. This plate extends half way up between the other two and an extension raises up in the center of the plate which forms the wall or makes two recesses in which the wire rope slides. Radius of center section, over which wire rope rests, is 7¼ in. *By W. T. Luttrell, California Shipbuilding Corporation.*

These War Winning Suggestions are from the Board for Individual Awards, War Production Drive

Spherical Jointed Chocks for Machinery Foundation

BY JOHN R. TUCKER
Norfolk Navy Yard, Portsmouth, Va.

Due to the construction of waterborne vessels of various types, foundations for machinery become a hand-fitting job. A wye-level has been used to determine differences in elevation of the anchoring points, but there is considerable mathematical work involved afterwards. If flat, non-adjustable plates are used, a machining problem is in prospect; but flat plates are not self-aligning and the only trustworthy point is the middle of the plate.

To overcome the disadvantage of rigid chocks, self-aligning plates on the ball and socket principle have been machined to suit various differences of level by making a mated pair of a certain height and installing them in their correct positions.

Few lathes are equipped to turn spherical surfaces, but practically every one can be altered to this type work if a few fixtures are made and attached to the bed and carriage.

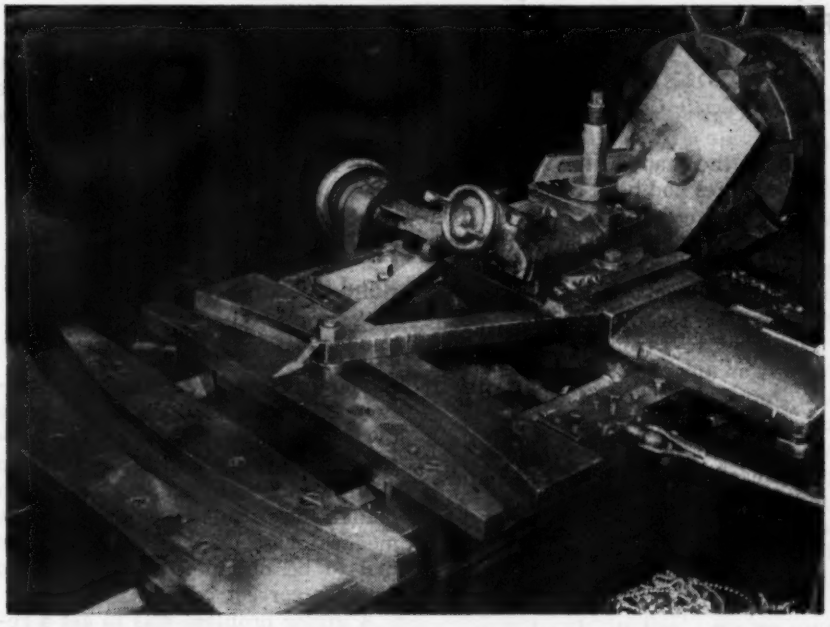
Once the radius of curvature has been decided upon, making a track cam is a simple process: suitable clamps for attaching the cam to the lathe bed are necessary. The center of the cam must coincide with the center of the bed, otherwise an incorrect curve will result. A follower frame is rigidly attached to the carriage and a cam roller attached to follower so that path of the slide across the bed follows the track cam. To control the depth of cut, the compound rest is swung to feed in the direction of the centerline of the bed.

Operation requires that the feed rod and leadscrew must not be connected to the carriage. The cutting tool is fed in the correct amount, then the cross feed is thrown in to take a cut across the face of the plate. Because the follower roll controls the tool as it moves across the lathe, a spherical cut results. Repeated passes deepen the cavity until the correct dimension of the thinnest part is obtained. If the socket has been machined first, the ball can be machined by turning the cam around and using it the same as before; in this way, both curves will be exactly alike. Additional cams can be cut for other curvatures.

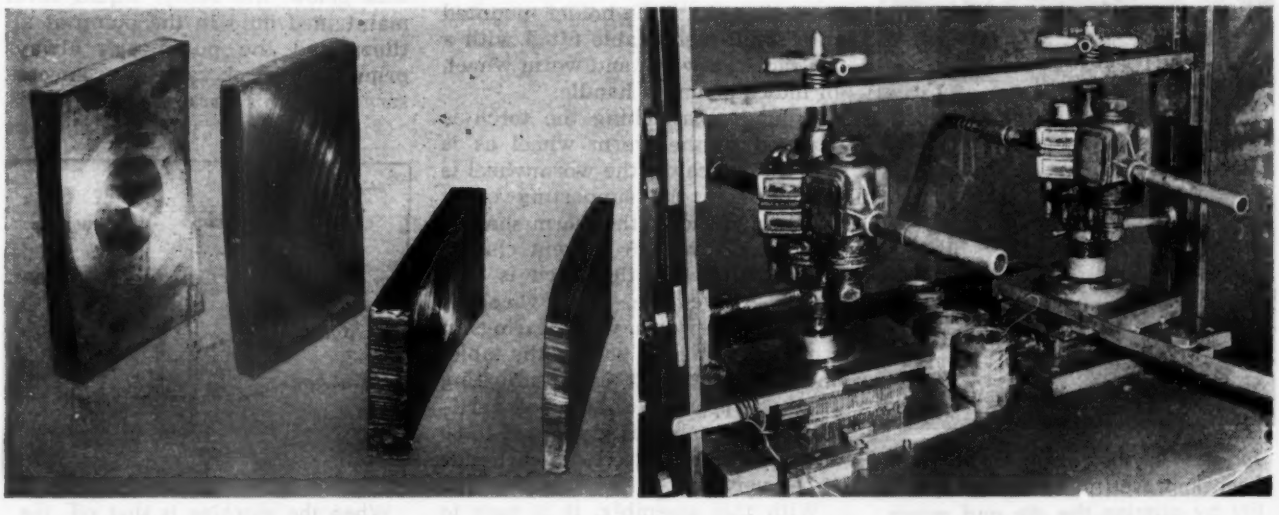
Machining spherical surfaces with a round pointed tool leaves a series of hills and valleys, even if the feed is very fine. Repeated shocks soon reduce these high spots, but there is no certainty that the surfaces are in uniform contact; to overcome this defect, a ball and a socket are lapped together by the use of either air or electric motors.

Because of the irregularity of levels, matched ball and socket chocks are kept in pairs.

In use, a chock pair is selected for



Curved surfaces, whether ball or socket, can be reproduced with accuracy by the use of a track cam and follower moving the carriage of a lathe



Left—Ball and socket chock blocks are made in various thicknesses, but the curvature is the same. Right—Air drills are held in a frame as a means for lapping the matched pairs of chock blocks

proper height and placed under the machine, then moved about on its spherical surface until a perfect bearing is obtained between the machine and the top surface of the block and the bed and the bottom surface of the block. When the machine is set solidly, the top and bottom halves of the chocks are pinned together securely to prevent shifting.

This type of block has eliminated many thousands of hours of tedious fitting for machine installation. *Suggestion Submitted Under the Navy Employees' Suggestion Program.*

★

War - Winning Suggestions

appearing on these pages were selected from those recognized as meritorious by the Board for Individual Awards, War Production Drive and the Navy Employees' Suggestion Program. They are freely offered to industry as an aid to war production.

★

Adjustable Hat Section Joggle Die For Various Section Depths

BY ROBERT FLOYD GANN
Douglas Aircraft Co., Inc., Santa Monica, Calif.

Due to the shape of the section, individual dies had been made for each part requiring a joggle. These dies distorted the flange when the joggle was made, because there was insufficient clearance for the metal to flow during forming.

To avoid this trouble, more clearance was provided in the die for the top and sides of the section crown, permitting the metal to flow when the flange was joggled. To provide changes in metal thickness and depth of section, the punch was split to take shims to compensate for differences in thickness and depth.

These alterations reduced the setting-up time and the handwork required to finish the various jobs, besides improving the quality of the work. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Joggles in the hat section have been improved in finish and quantity by altering the die and punch to accommodate variations in shape and thickness

Plate Bevels Flame-Cut With Hand-Operated Protractor

BY EARL J. JOHNSON
Navy Yard, Philadelphia

Under previous methods, correction of the beveled edge was done by welding and grinding. The protractor was adjusted by easing up a wing nut, then tapping the torch holder the estimated amount. Some means for securing a correct angle had to be obtained in an effort to produce correct bevels.

A major problem was to get a reliable angular adjustment of the cutting torch and stop guesswork.

An attachment was developed consisting of a torch holder mounted on a small metal table fitted with a protractor, a worm and worm wheel, an indicator and a handle.

A lug for attaching the torch is fastened to the worm wheel as is also the indicator; the wormwheel is journaled in the supporting table. On the far end of the worm shaft is a locking device to prevent change of position while the torch is cutting. Above the wormwheel is mounted the worm, with bearings in a bracket which is part of the table; on the worm shaft is an adjusting knob. A protractor, attached vertically to the table, is graduated to 60 deg., by single degrees, on each side of the vertical.

With this assembly, it is easy to burn correct bevels from 0 deg. to 60 deg. without stopping to change the machine. All that is necessary is to lay out the plate properly and adjust the torch correctly by changing the protractor setting.

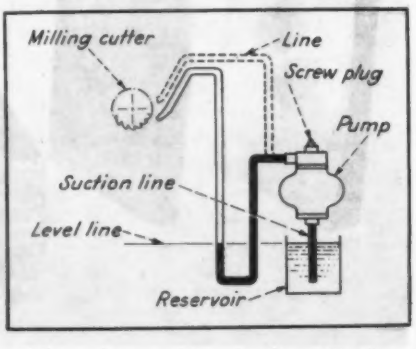
Flame cutting bevel edges of plates is a precision operation, because this attachment can be adjusted quickly and locked in position

With this machine, precision flame cutting eliminates guesswork and rough finishes from the process of beveling plates. *Suggestion Submitted Under the Navy Employees' Suggestion Program.*

Self-Priming Discharge Line For Coolant Pumps

BY ERNEST BERGER

Unable to keep check valves tight because of dirt entrained by the coolant, a gear pump had to be primed through a plug in the discharge line. By looping the discharge line so that its lowest point was below the sump, liquid level maintained fluid in the pump at all times and the pump was always primed. No check valves were necessary with this arrangement.



When the machine is shut off, the coolant level does not fall below the sump level in the pipe

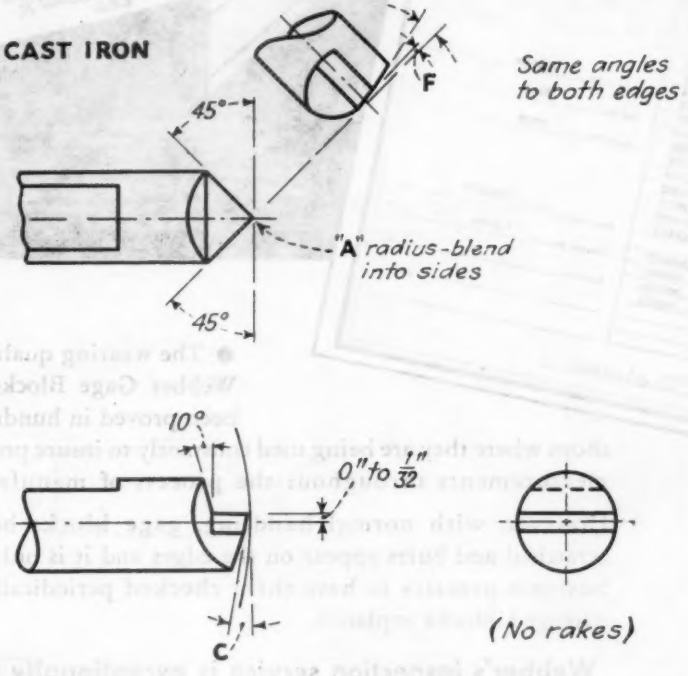
AMERICAN MACHINIST REFERENCE BOOK SHEET

Finish Boring of Various Materials—I

BY BRUNO HOLMSTROM, TOOL SUPERVISOR, HEALD MACHINE COMPANY

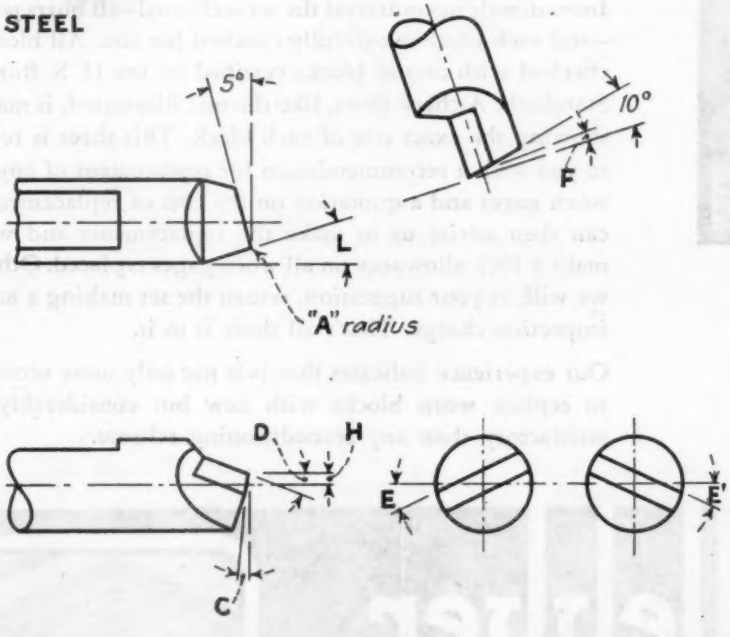
These charts show "starting" shapes on carbide-tipped tools for precision boring at high speeds and light cuts. Modifications must be made if speeds are lowered or stock removal is increased.

CAST IRON



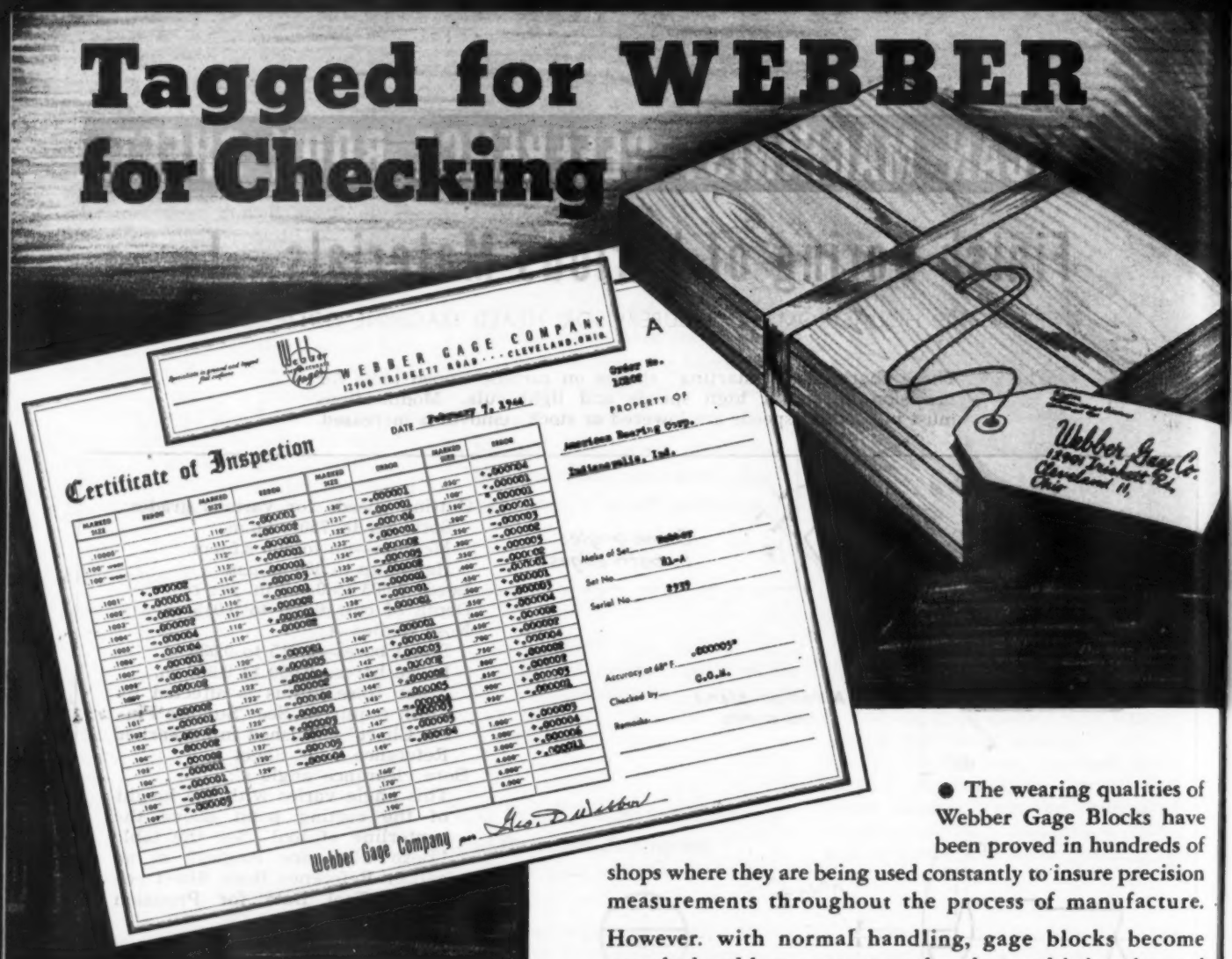
Cutting speeds for various grades:
Soft—up to 750 s.f.p.m.
Medium—up to 500 s.f.p.m.
Hard—up to 300 s.f.p.m.
Lead: 0.003 to 0.006 in. per rev.
Depth of cut: 0.005 to 0.015 in.
Nose Radius *A:*
Small bores—0.015 to 0.030 in.
Large bores—0.030 to 0.060 in.
Note: Nose radius is affected by finish required. See "Surface Finish Chart" published in an earlier Reference Book Sheet
Bore clearance angle *C:*
This angle varies with the height of the cutting point above the centerline of tool. See the table "Bore Clearance Angles" in an earlier Reference Book Sheet entitled "Tool Data for Precision Boring."
Side clearance angle *F:*
See table of "Blending Angles" in an earlier Reference Book Sheet entitled "Tool Data for Precision Boring—II."

STEEL



Cutting speeds:
See "Surface Speed Chart" in an earlier Reference Book Sheet
Lead: 0.003 to 0.007 in.
Depth of cut: 0.005 to 0.015 in.
Nose radius *A:*
Keep small, approximately equal to depth of cut, but 0.010 is usual.
Lead angle *L:*
Not affected by light cuts
Bore clearance angle *C:*
See note under Cast Iron
Height above center *H:*
This modifies clearance angle *C*
Side clearance angle *F:*
From 2 to 3 deg. are adequate
Rake angles:
Back rake *D:* from 0 to 35 deg. neg.
Side rake *E:* from 0 to 8 deg. neg.
Side rake *E'*: from 0 to 35 deg. pos.
Note: In reference to material, the rake angles are:
High-carbon and alloy steels:
D=0 to 6 deg.; *E*=3 to 8 deg.
Interrupted cuts and tough steels:
D=5 to 35 deg.; *E'*=15 to 35 deg.
Low-carbon and free-cutting steels:
D=3 to 10 deg.; *E'*=0 to 15 deg.

Tagged for WEBBER for Checking



Send your gage blocks, regardless of make, to Webber for checking and insure the continued accuracy of your product by the guaranteed accuracy of your gage blocks. For any further details consult Webber Gage Co.

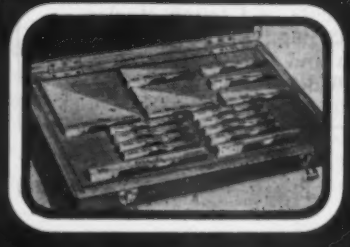
● The wearing qualities of Webber Gage Blocks have been proved in hundreds of shops where they are being used constantly to insure precision measurements throughout the process of manufacture.

However. with normal handling, gage blocks become scratched and burrs appear on the edges and it is only good business practice to have them checked periodically and damaged blocks replaced.

Webber's inspection service is exceptionally fast, economical and covers all makes of gage blocks

Immediately upon arrival the set is cleaned—all burrs removed —and each block is carefully checked for size. All blocks are checked with master blocks certified by the U. S. Bureau of Standards. A check sheet, like the one illustrated, is made out showing the exact size of each block. This sheet is returned to you with a recommendation for replacement of any badly worn gages and a quotation on the cost of replacement. You can then advise us to make the replacements and we will make a 10% allowance on all worn gages replaced. Otherwise we will, at your suggestion, return the set making a nominal inspection charge. That's all there is to it.

Our experience indicates that it is not only more economical to replace worn blocks with new but considerably more satisfactory than any reconditioning scheme.



Webber GAGE COMPANY

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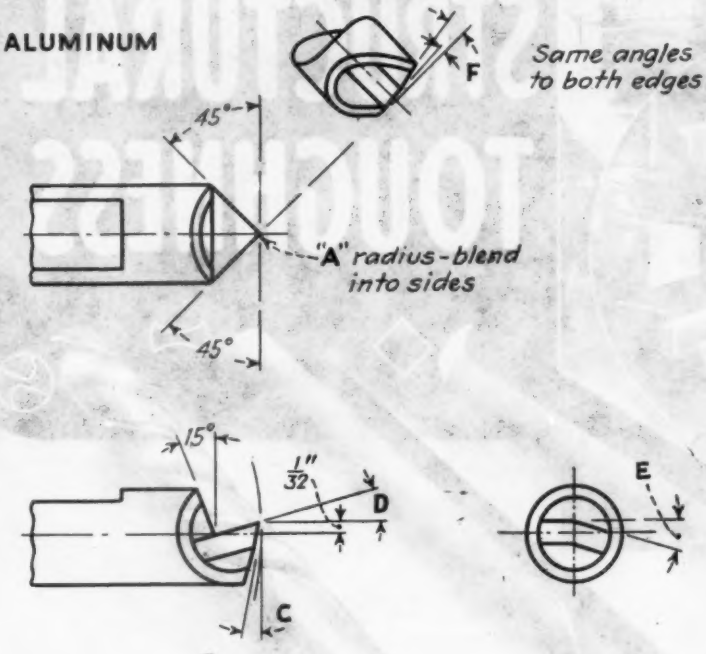
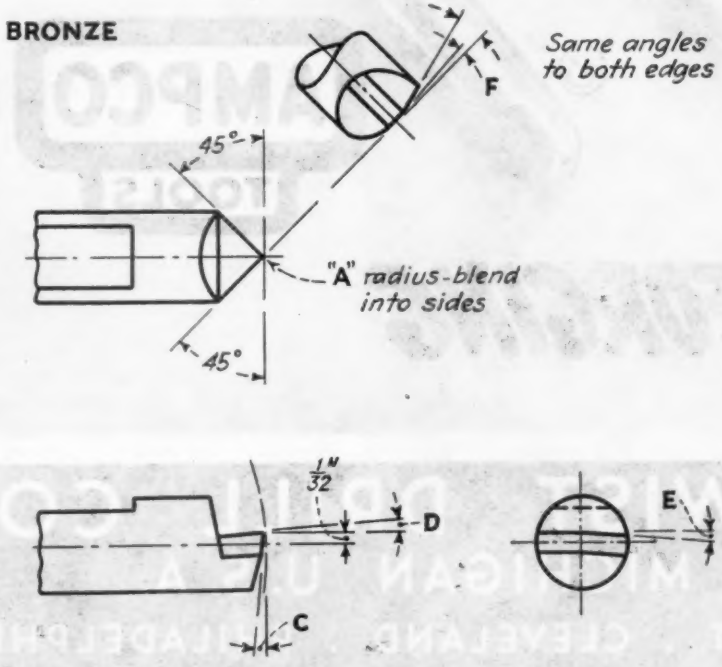
Finish Boring of Various Materials—II

ALUMINUM



Cutting speed: 1000 to 3000 s.f.p.m.
Lead: 0.003 to 0.006 in. per rev.
Depth of cut: 0.005 to 0.015 in.
Nose radius *A:*
Small bores—0.015 in.
Large bores—0.015 to 0.060 in.
Bore clearance angle *C:*
See table in earlier Reference Book Sheet entitled "Tool Data for Precision Boring."
Side clearance angle *F:*
See table of "Blending Angles."
Back rake angle *D:* 0 to 15 deg.
Side rake angle *E:* 5 to 15 deg.

BRONZE



Class I—Leaded copper, leaded commercial bronze, leaded red brass, free-cutting yellow brass, forging brass, leaded naval brass.

Class II—Red brass, yellow brass, muntz metal, naval brass, tobin bronze, leaded phosphor bronze.

Class III—Copper, chrome copper, commercial bronze, nickel silver and beryllium copper.

Cutting speeds:
Class I—800 to 3000 s.f.p.m.
Class II—450 to 1500 s.f.p.m.
Class III—200 to 800 s.f.p.m.
Lead: 0.001 to 0.005 in. per rev.
Nose radius *A:*
Small bores—0.015 to 0.030 in.
Large bores—0.030 to 0.060 in.
Note: See "Surface Finish Chart."
Bore clearance angle *C:*
See the table "Bore Clearance Angles."
Side clearance angle *F:*
See table of "Blending Angles."
Rake Angles:

	D	*E*
Class I	0	5
Class II	0 to 5	5 to 10
Class III	5 to 10	15 to 20

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Russian Cancellations

The halt of lend-lease shipments to Russia with the end of the European War has resulted in the cancellation of some $70,000,000 in AA-1 tool orders for the Soviet, which radically changes the status of the machine tool industry, and improves prospects for delivery of automobile reconversion tools. The reason is that the $70,000,000 in standing Russian orders (the balance of an original order of $120,000,000) were scheduled for delivery by September 30, 1945, and bore AA-1 ratings. However, tool builders had been trying to sandwich these orders into schedules laden with high priority military orders and urgently needed tools to reconvert the automobile and other industries back to civilian production. Tool builders had been trying to keep the military, the Russians, and the reconverting industries happy, while France, Belgium, and other nations were clamoring for machine tools, also.

The current easier situation stems from the fact that Russian tool orders will be divided up among reconverting industries, France and Belgium. The French and the Belgians have been finally given a AA-3 priority for tool orders, and will be permitted to take over Russian tools in advanced stages of production, since they use the 50-cycle current that Russia uses. Such standard tools that can be used by reconverting industries will be diverted to them.

Tool Makers' Prospects

For the tool industry, May witnessed the heaviest cancellation of any months since the war started. Besides the cancellation of the $70,000,000 in Russian orders, it is estimated that about $15,000,000 in rated military orders were also wiped off the books. Allowing for deliveries and cancellations in May, military orders in the hands of the industry have probably fallen to about $110,000,000, the lowest level in years, representing less than three months' deliveries. This is all that stands in the way of rated orders for reconversion tools required by the auto industry ($40,000,000) and by other industries ($5,000,000). Since delivery dates for such orders extend into the Fall, the industry should be able to cope with the remaining urgent orders.

Bolstering the industry's backlog of $155,000,000 in military and reconversion orders, are $40,000,000 in unrated civilian orders, and as much foreign business as the industry can handle for the present. The French are trying to place a reported $130,000,000 in tool orders, while Belgium is seeking a somewhat smaller amount. In addition, Latin-American nations are anxious to spend millions for new tools.

Substantially, the transfer of the Russian business to other takers does not radically change the industry's backlog, while the granting of the AA-3 rating to France and Belgium (and probably other countries will be in line for similar ratings) assures the placing of substantial new orders for some months to come. However, some plants will be hard hit temporarily by Russian cancellations, particularly those working on special items.

Auto Prospects Brighter

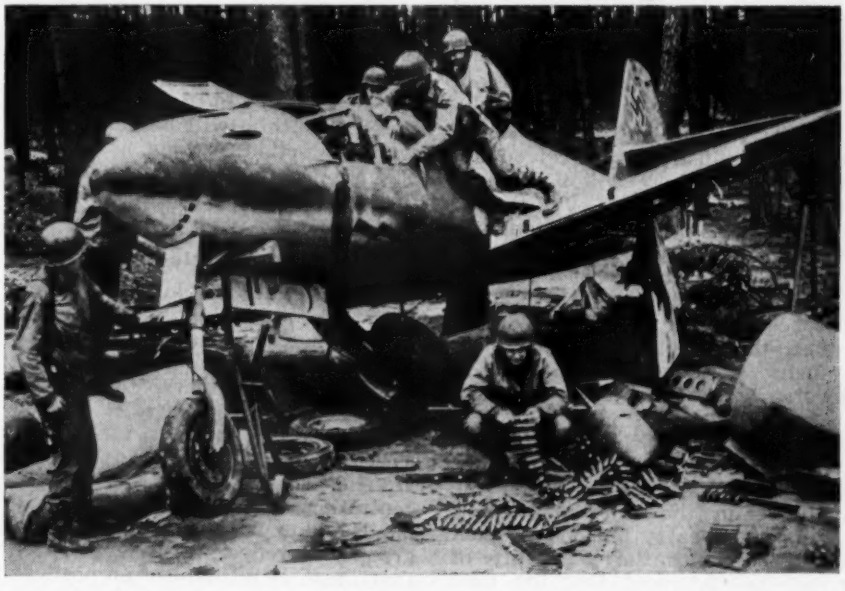
In addition to its windfall in taking over some Russian-ordered tools, the auto industry is being aided by WPB in securing presses, rated as the worst bottleneck item in its equipment requirements. WPB is examining unfilled orders on the books of press builders to uncover items riding on priorities under orders which have since lost their military sponsorship. It is believed that there are an adequate number of such orders to permit rearrangement of standard press deliveries to the point where the auto industry could get them in four to six weeks, according to press builders. However, some special presses needed by auto makers will not be speeded up by this procedure, and deliveries will take six months.

On materials, the auto industry is still uncertain of securing enough flat-rolled steel from the mills, but some relief is expected by the industry's probable resort to surplus materials, substantial quantities of which have been piled up as a result of military cutbacks.

Russian Business

Although Russian lend-lease has ended, Russia has been given AA-3 priorities on any cash orders it may wish to place. At present, the U. S. cannot extend credit to Russia, under the terms of the Johnson Act, although Canada is shipping material to Russia on credit. At the same time, although Russia has naturally preferred new tools under lend-lease, it is likely that it will be prepared to accept used tools, if necessary, in order to secure badly needed equipment.

It is reported that Russia plans to expand her steel capacity to 60,000,000 tons from 10,000,000 tons. This would mean that the Soviet would require thousands of additional tools to machine its increased steel output. Russia will make some of her own tools, and is seeking rights to manufacture American tools for its own use. However, it is believed that the Soviet will accept any and all types of tools available under cash or credit terms.



German Jet Data Now Available—Captured German jet planes, such as the one shown here, should help American engineers further improve our jet planes for use against Japan. American technical missions now in Germany are examining various types of German materiel with an eye to adaptation for our military machine in the Far East

Flat-rolled Steel May Prove Reconversion Bottleneck

500,000 "free" tonnage for third quarter does not assure adequate flat-rolled steel for reconversion needs. Lack of rating by auto industry may stir trouble. Only makers of refrigerators and washing machines have priorities

PITTSBURGH—Although no important changes are expected in third quarter steel operations, the big problem in coming months will be how much "free" tonnage will be available and who will get it. Buyers are beseiging district offices of steel companies for a place on order books after July 1, which is the date of entry for unrated business. The tonnage being ordered runs heavily into the light flat-rolled items, as might be expected, since civilian products will require a large amount of sheet and strip steel.

The WPB has set up a priority plan for steel sufficient to make 350,000 washing machines and 265,000 refrigerators during the third quarter. These are the only two civilian items, not previously allotted steel, which will receive priority metal in the third quarter. In the meantime, makers of steel have rated tonnage on the books which will occupy their sheet and strip facilities on the basis of available semi-finished steel until the end of the year.

Auto Industry Steel

This brings up the question of how the auto industry will be able to obtain enough steel to produce the permitted 200,000 cars during the second half of 1945. This would appear impossible on the basis of statistics, but there is no excitement in the auto industry over its possible inability to obtain steel, and no buzzing in the steel industry about it. The answer seems obvious: the auto industry has received assurances that there will be enough steel to make the cars, even though it has to come out of "free" tonnage. WPB has estimated that there will be approximately 500,000 tons of "free" steel during the third quarter. Cutbacks in war contracts will increase that amount, but the steel industry does not expect this to develop before the fourth quarter.

Semi-finished Diverted

However, the 500,000 tons of "free" steel which the WPB expects to be available in the third quarter is not specified as to finished product which precludes the possibility of a definite statement that the auto industry can have 150,000 tons of it in the form of sheets and strip. Yet, that is what is expected to happen.

This expectation is partly based upon the industry's ability to channel semi-finished steel freed by cutbacks into the light flat-rolled departments. For example, cutbacks in shell steel would permit the channeling of raw steel to the strip and sheet mills. Such diversion is expected to provide the first small trickle of automobile sheets, but since such sheets require from four to six weeks for processing before it can be shipped by the mill, chances are that auto production cannot begin before September. A local producer of auto accessories has programmed his parts production to start in August.

Rating Trouble

WPB's failure to give the auto industry a rating on its steel will provide a headache for the steel industry. If the auto industry gets its steel and other types of consumers do not, there will be cries of discrimination from the many industries trying to reconvert.

Objections to the increases in steel prices awarded last month have come largely from small producers. They still talk of filing formal objections on the ground that the increases are inadequate. Meanwhile, there are no indications of what decreases might be ordered by the OPA. OPA stated, in granting the increases, that compensatory decreases would be ordered in other steel items.

Both the national and Pittsburgh steel ingot rates have held above 90 percent of capacity. Cancellations probably have not reached their peak yet, but surveys indicate that these cuts are mainly against the backlog. But even if they reach a level to affect steel production—considered unlikely in the third quarter—the mills would probably stock ingots or semi-finished steel in preparation for increases in civilian type orders.

Operators of U. S. Tools May Buy Them; Other Regulations Changed

WASHINGTON—With the intention of aiding reconversion while assuring support of the tough warfare ahead, the government has made a number of changes in controls regulating production and distribution of machine tools. The most notable change was the announcement by the Surplus Property Board that "contractors-in-possession" of government-owned tools may purchase any of the tools in their plants, provided that they will be retained in war production as long as needed. The auto and other reconverting industries had been awaiting action on this matter for some time.

Enough Surplus Tools

Under Regulation No. 6 of the Surplus Property Board, contractors making such purchases must waive their option over the remaining equipment owned by the government in their plants, so that sales of such excess may be made to other purchasers. SPB pointed out that there are elaborate safeguards against concentrations of equipment in some hands and undue advantages to some groups. Moreover, SPB emphasizes that there is no danger of postwar shortages in machine tools due to sales to war contractors now. The government owns 75 percent of all tools four years old or less, more than half of which are in government-owned plants and are unaffected by this regulation. Sales prices will be those established as the "Clayton Formula" (AM, 8/3/44, p. 124b).

Other changes include: (a) Equipment Order E-1-b has been amended so that all special controls over production and distribution of machine tools with a retail value of less than $1000 are removed; (b) Photostatic copy of WPB-542 no longer is required.

AA-3 Rating Status

In commenting on its AA-3 rating on machine tool orders for reconversion, WPB officials said military cutbacks will be offset by mounting demands at home and abroad "for an indefinite period before slipping back to a solid or pre-war basis."

Tools and construction are now the main bottleneck to preliminary reconversion. Materials and components will be critical later. It was explained again that the AA-3 rating is secondary to military needs, and that such civilian production will get no preferential treatment. WPB proposes to lift as many restrictions as possible, but cannot guarantee for civilian use materials other than those not needed for war. About 500,000 tons of carbon steel will be allocated for civilian production during the third quarter, but rubber, tin, lead and others will remain short.

Detroit Letter

Ford Leads Race

Just as it is expected to lead the reconversion race to put out the first automobile since February 1942, so the Ford Co. has taken the lead in giving the public the first glimpse of its first postwar car. The picture, while not too revealing, showed the front end of the eight-cylinder Ford and described in few words some of the improvements which it expects to incorporate, within the limits set down by the War Production Board.

The pictures, such as they were, created quite some consternation among rival companies. Press agents had been begging for months to have pictures of hand-built models released. Now some of the companies are tearing their hair for not being the first.

Chrome Use Questioned

In some pique, a few of Ford's rivals have run to the WPB with the complaint that the new model shown in the prints has an excessive amount of chrome on the radiator, grilles, fenders, etc.

So far WPB has shown little concern. It has told the industry to go ahead and produce models and is not concerned whether they have chrome or lack it. A WPB spokesman said it will sit up and take notice when critical materials are affected and not before.

There is some feeling in the industry that the excessive use of chrome on the first models would not be a good thing. Chrome has nickel under it and nickel is one of the scarcer materials.

The Ford Co. is sitting tight and cashing in on the nationwide interest in new cars.

Spare Parts Needs

But right now the industry is more concerned with other things. Some of the car builders want to make some slight changes in non-functional parts and have applied to WPB for help. They have their old dies on hand which they have been using to make replacement parts, such as doors, fenders, etc. What they are asking WPB now is for help to get materials so they can run off a supply of spare parts before they start changing their dies to make the improvements they contemplate.

Once they get materials to run off the spare parts, they can turn to filling in the old dies to produce some additional "face lifting" for the postwar models. Many who have had large cancellations, may declare some of their steel "idle and surplus" and use that for their spare parts runs. WPB itself has taken no action on the request.

Because of the shortage of tires, it was contemplated to put out the first postwar passenger cars with only four tires. But this too may change.

The tire situation is straightening out very well and WPB is now inclined to resurvey the conditions in the last quarter, when the first cars will really start coming off production lines, and may allow extra tires.

New Cars When?

Predictions on when the first cars will come off the assembly lines have ranged from next July to late in September. The truth is that no one knows, because of the materials situation.

Materials, an observer in the industry recently pointed out, are still in a confused state. No one knows what substitutions may be necessary when the auto manufacturers are ready to go into production. Present plans may have to be sidetracked if certain materials don't come up as expected. On the other hand, this observer remarked, materials may be eased to such an extent that few substitutions except to better the product will then be necessary.

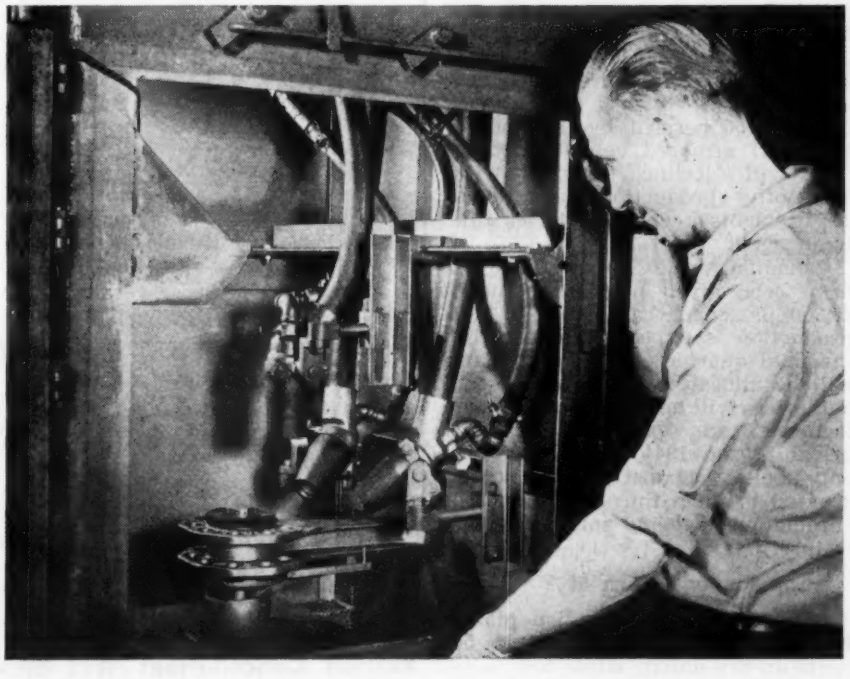
30-Hour Week Drive

Labor strife still looms large in the reconversion picture. The UAW-CIO plans to press for its "modern work week" of 30 hours when it starts renegotiating its present closed shop contract with Ford on June 18. The plans were disclosed at the recent meeting of the UAW executive board in Chicago. This will be the start of a national 30-hour week drive.

Dick Leonard, national Ford director for the UAW, disclosed that the demands have been drawn up which will ask the 30-hour week to spread employment, wage increases to compensate for the shorter work week and a pension plan which contemplates retirement of aging Ford workers on 75 per cent of their annual wages.

Another battle looms in the clash between the CIO and AFL in the reconversion period. The Automotive Council has sought to head off this clash by appealing to the WPB to do something about it. Now it seems headed for a showdown between the rival unions.

The AFL building trades unions are demanding that their men be used on all reconversion maintenance and construction work. The CIO wants its members to be given preference. A nice fight lies in that direction.



Shot Peening—Studebaker gains a several-fold increase in an improved shot peening process for connecting rods for "Flying Fortress" engines. Key to precise control of this method lies in clusters of double-throated nozzles, shown here. Metered shot is fed by gravity down the larger throat of each nozzle and is picked up by air rushing from the second throat at 100 lb. per sq. in. The upper flat surfaces and inside channel surfaces of a master rod are being peened here, as the part slowly rotates

Canada Continues Russian Aid On Credit; Surplus Returns Low

MONTREAL—The ending of Canadian Lend-Lease for Russia does not halt the shipment of Dominion goods to the Soviet, since shipments may be continued under credit terms. This is made possible by the Exports Credits Act passed in 1944, which made possible a written agreement with Russia to the effect that capital goods would be paid for under a guarantee or credit provided in the Act.

Canadian shipments to Russia to date include: 1,188 tanks, 842 armored cars, 2,568 trucks, 827,000 shells, 34,800,000 cartridges, 5,000 tons of gunpowder, 36,300 tons of aluminum, 9,100 tons of lead, 23,500 tons of copper, 6,700 tons of zinc, 1,324 tons of nickel, 13,300 tons of rails. Although these shipments are somewhat smaller in volume than those of the United States, they augment such tremendous shipments to Russia including: 6,800 tanks, 360,000 trucks, 13,300 planes, 312,000 tons of explosives, 1,800 self-propelled guns, 135,000 submachine guns, 13,000 pistols, 1,500 locomotives, 9,800 flat cars, 540,000 tons of rails, and so on.

War Output Plans

Canada's war production program for the period ahead was briefly outlined recently by Munitions Minister, Hon. D. C. Howe: (a) aircraft production will continue indefinitely; (b) shipbuilding will call for a continued high rate of deliveries well into 1946; (c) gun and small arms manufacture will show a progressive cutback, possibly as much as 50 percent by the end of 1945; (d) armored vehicle production will decline sharply, with automotive production for civilian requirements keeping factories fully engaged.

Canadian auto manufacturers have been given permits to make 10,000 passenger cars in 1945, and production is expected to start by the final quarter of the year. Cars will be allocated to essential users, and prices will be controlled. Manufacturers are expected to hold prices at the 1941 level, with the only relief against higher costs granted to them thus far being the elimination of the 10 percent manufacturers' tax.

Plants Return 50%

Sales of surplus Canadian plants have been bringing in about 50 cents on the dollar, while tool sales are netting some 35 percent of cost. The government has indicated that it is not as interested in dollar returns as it is in how much employment in peacetime will be provided by firms purchasing such plants and equipment. A number of American companies have been purchasing surplus Canadian plants to establish subsidiaries in the Dominion.

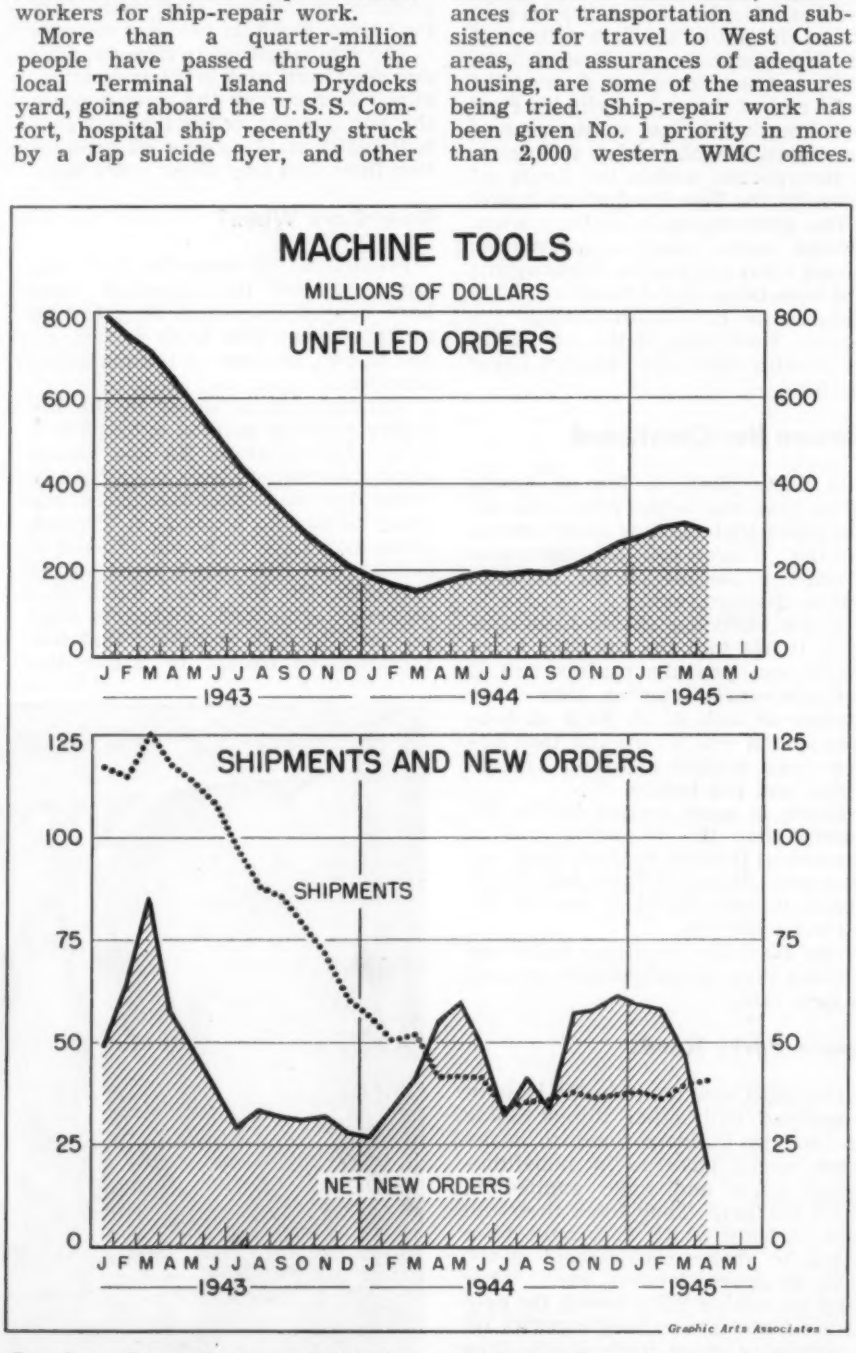
Public Views Damaged Ships In Navy Move to Get Workers

LOS ANGELES—Inviting the public to come and see battle-damaged ships for themselves is the Navy's latest move in the attempt to recruit workers for ship-repair work.

More than a quarter-million people have passed through the local Terminal Island Drydocks yard, going aboard the U. S. S. Comfort, hospital ship recently struck by a Jap suicide flyer, and other fighting vessels needing repairs.

The immediate and urgent shortage of Coast naval stations and private yards for ship-repair work was recently set by Secretary of Navy James Forrestal at 15,000 workers, especially machinists, electricians, sheet metal workers and pipefitters.

Unusual inducements, including blanket draft deferments, allowances for transportation and subsistence for travel to West Coast areas, and assurances of adequate housing, are some of the measures being tried. Ship-repair work has been given No. 1 priority in more than 2,000 western WMC offices.



Russian Cancellations Will Ease Picture—Cancellation of Russian Lend-Lease orders, coming on the heels of military order cuts, will ease pressure for current deliveries. Although the auto industry and Belgium and France are taking over some of the cancelled Russian tools in process, backlog at the end of May probably dropped below April's $287,920,000. May cancellations were expected to exceed April's high level of $26,362,000, while new orders in May were probably close to April's $43,965,000. Shipments should continue around the April level of $40,331,000

Washington Bulletin

Russian Steel

Russia's plan to expand her steel production several fold, revealed the other day during a Congressional hearing, will tend to increase the Soviet requirement for American machine tools, rather than decrease it, in the opinion of informed officials here. The Russians have always had plenty of steel to build all the equipment they wanted to build. Testimony at the hearing indicated the steel expansion would be from 10,000,000 to 60,000,000 tons annually. The latter figure would be equal to American production before the war. The Russians may produce a lot of machine tools eventually but during the early future they will have to import them in large volume.

Want Tool Plans

Machinery association men here have information that Russia has been asking for drawings of various types of machine tools and equipment, with the intention of producing same. They say it is not common in this country for the owners of designs to sell them directly abroad; even when high fees are obtained, the sale of specifications is not considered sound business. Usually such data does not work out well for the purchaser, either. In Russia, China, Japan, and other countries, the purchasers of engineering data have usually asked for the engineers along with it. Such information and service is generally sold in connection with construction, not equipment. Both Russia and Japan, several years ago, bought single American airplanes for engineering purposes, apparently without favorable results.

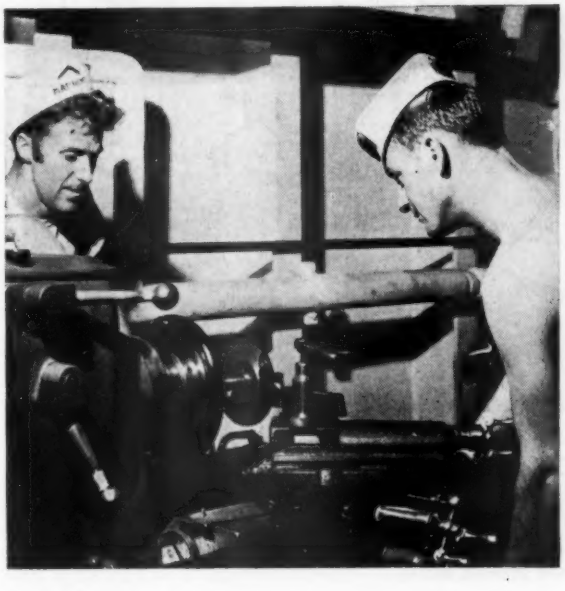
The potential market for machine tools and other machinery and equipment in Germany and Japan has already engaged the attention of interested producers and government officials. Right now the United States Air Forces are busting up equipment in Japan, which was made by Americans, who have furnished the target information. In fact, some of it was sold under long term financing plans, and we are destroying our own property. Presumably both Japan and Germany will be allowed to manufacture civilian goods, and if they can establish credit, they will constitute large markets for the metal working industries of this country.

Air Cut Equipment

Army's 30 percent cutback on airframes will make available very few machine tools that will be useful in reconversion. Most of the aircraft production machines are of the special purpose type. One authority questioned said some of the sheet metal presses could be used in the production of automobiles and other sheet metal goods, but their adaptation would be difficult and in most cases would not pay. But a great many of the machine tools that will be released shortly by stop orders in the aircraft engine and propellr field, will be in demand.

British Auto Exports

British manufacturers will make a strong bid for the world's small automobile markets after the war, but will probably leave the big car field to the United States, according to Lord Nuffield, an English car producer. He was quoted in a dispatch by United Press. Nuffield said that British big-car makers still cannot compete with Americans.



"Sail-jers" On Floating Repair Ship — The two former Detroit machinists, shown here turning a B-29 part, are soldiers, but wear sailors garb while aboard a floating aircraft repair shop. The men are helping to service Superforts in the Marianas under direction of the Air Technical Service Command. Crews work aboard or ashore. Ships have these shops: machine, welding, sheet metal, heat-treating, ordnance, radar and radio and others.

Assistant Attorney General

Tom C. Clark

Newly appointed successor to Thurman Arnold, as Assistant Attorney General in charge of the Justice Department's anti-trust activities.

Warship Construction

The United States will soon find itself in possession of a Navy that has no near equal on the globe, and no enemy in sight to fight with it. If we come to speaking softly and carrying a big stick, as recommended by Theodore Roosevelt, we will have the stick. Under construction at this time are 20,000 warships, including 271 frontline fighting ships and 16,093 landing craft. Of the fighting ships, two are battleships, 15 aircraft carriers, 30 escort carriers, 47 cruisers, 104 destroyers, and six destroyer escorts. These figures were compiled by United Press in a recent survey. Current construction will give the U. S. Navy 25 battleships, 41 carriers, 95 escort carriers, 114 cruisers, 490 destroyers, and 371 escorts. Since Pearl Harbor 100,000 ships have been added to the Navy, including 3000 converted from civilian craft.

Farm Machinery Up

Production of farm machinery must be boosted 30 percent above this year's level in the coming crop year of 1946, WPB officials told the Farm Machinery and Equipment Labor Advisory Committee at a recent meeting. Only tractor production is on schedule; all other items are 7 to 28 percent behind. The Committee recommended more overall planning by WPB and other agencies concerned, a survey of the manpower involved, and an exact definition of the farm machinery industry. Quota restrictions on production up to July 1, when all such restrictions on the industry under L-257-C will be removed, were eased for June. There may be more determined action on farm equipment.

Spotting the Air News

Cutback Surprises

At least three important points should be noticed in connection with the Army's 30 percent cutback in aircraft production: (1) It came as a complete surprise to some important branches of the Air Force itself, including the Air Service Technical Command at Wright Field, Dayton, and to several manufacturers, including Consolidated, which did not know that its B-32, running mate of the B-29, was going to be cut.

(2) This cutback could be followed at any time by additional reductions, and it certainly will be followed immediately by a big shakedown in the two companion industries: engines and propellers.

(3) The cutback statement indicates convincingly that the Army believes it can polish off the Japanese with advanced models of airplanes already in use. These airplanes are chiefly: the B-29 *Superfortress*, the P-51 and P-47 *fighters*, and the P-80 jet-propelled *Shooting Star*. The first three are old, having been designed before the war. Built by Boeing, North American, Republic, and Lockheed respectively. Navy, which has indicated no cutbacks, is still developing new shipboard planes not yet mentioned.

Postwar Vs. Prewar

The postwar aircraft industry should be viewed and estimated in comparison with its prewar size and not with its wartime peak, which should be forgotten. T. P. Wright, Civil Aeronautics Administrator, recently told the Royal Aeronautical Society in London that within ten years American aviation will employ 12 times its prewar payroll.

Wright cited four new developments which he says will lead the aviation advance: gas turbine and jet power plant; aerodynamic design improvements which will make super-sound speeds possible; electronic navigation aids which will permit all-weather flying (necessary if air transport schedules are to be depended upon); and improved light planes and rotorplanes which will have utility comparable with that of automobiles. He predicted airline speed of 300 mph at 3c per mile. Mr. Wright warned that in future, flying bombs, perhaps charged with poison gas, can be stopped only by preventing their production.

Helicopter Innovations

Potential utility of helicopters, especially their independence of landing fields, continues to interest the public and many manufacturers.

One late development is a twin-rotor copter by Kellet Aviation Corporation, a pioneer autogyro designer. The Kellet copter achieves the advantage of two rotors (they cancel out each other's torque, eliminate the tail torque propeller) by mounting them on hubs about four feet apart and gearing them so that the rotating blades intermesh after the manner of an egg beater.

Another development is the finding of jet propelled helicopters built by the Germans just before the war's end. A helicopter rotor driven by jets on its trailing edges develops no torque to re-act on the fuselage.

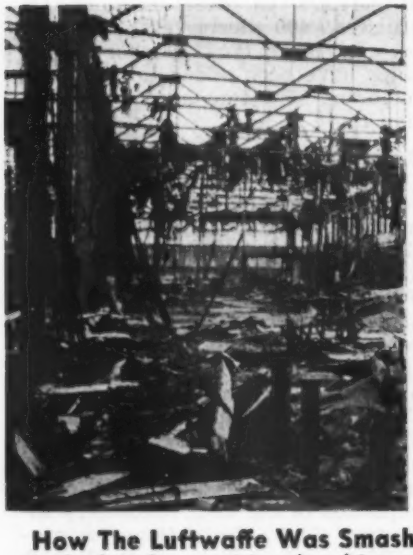
A third new development is the "flying belt" or "Hoppicopter" designed and built by Horace T. Pentecost, Boeing employee, at Seattle. It is simply a very light (90 pounds) helicopter which, instead of having a fuselage and landing gear, simply rests on the operator's back when grounded, and supports him in a harness in flight. Obviously its utility is limited, and it could be rough on the operator in an uneven contact with the ground.

Plane Scrap Recovery

Aluminum Company of America's success in developing a process for returning airframes to pure aluminum may influence the Government in forming its policy on scrapping of otherwise useless airplanes.

Almost certainly the value of pure aluminum thus obtained would be less than its cost. On the other hand, if aluminum sources have been depleted as reported, the cost of a stockpile for defense might be a secondary consideration. Also there is the risk of leaving it abroad for future enemies to shoot at us.

Briefly, the ALCOA process is a caustic soda bath which breaks down the alloying elements and dissolves the aluminum, not attacking at all the other materials.



How The Luftwaffe Was Smashed—The effects of high-altitude precision bombing attacks carried on in daylight by American airmen are shown in these photos of two knocked-out German aircraft plants. Left photo shows all that was left of a reinforced-concrete plant which had been assembling Messerschmitt-109 at Regensburg, Germany, although three large German hospitals surrounding the building remained unscarred. Right photo shows the remains of another Me-109 factory at Obertraubling, Germany, where the bombings also destroyed many New Me-262 jet planes stored there.

100,000 More Women Will Be In Detroit Work-Labor Dept.

DETROIT—If Detroit is any criterion for all war centers, then this is what the U. S. Department of Labor thinks will happen to women in industry:

One hundred thousand more women will be in labor market here after the war than were working in 1940. In addition, 14,000 girls are entering the labor market annually.

About 339,000 women will figure in the Detroit labor market for a limited time after the war, but the number will then go down to 312,000. About 27,000 women plan to stop working as soon as their husbands or other wage earners in the family are released from military service. About 19,000 others expect to leave the Detroit Area and seek jobs elsewhere. Another 283,000 now in business and industry plan to fight for their jobs.

85% Will Work

Of those employed before Pearl Harbor, the survey shows that 85 percent will continue to work. Of those not previously employed, 70 percent will seek postwar jobs. Fifteen thousand household workers intend to remain at these jobs. More than 80 percent of the former school girls and 60 percent of former housewives will seek work after the war. About 90 percent of the women engaged in civilian manufacture and trades or profession planned to continue. The same proportion holds true of those in war work.

Of the 283,000 women in business and industry, 241,000 need their jobs to support themselves, aged parents, children or other relatives. Fully 50 percent of those who will make up the postwar labor force are under 30. Probable postwar employables include 34,000 negro women.

Beach Wins Hyatt Award

NEW YORK—Top honor in the fields of plastics, the John Wesley Hyatt award, was presented here to William I. Beach, chief plastics engineer for North American Aviation, at a dinner attended by high industry and government officials. Dr. Lyman J. Briggs, director of the National Bureau of Standards awarded the medal and $1000 to Beach.

Beach received the award in recognition of his originality and research in the development of a process for plastics forming by methods competitive with metal forming techniques. Besides the advantage of increased production and improved performance of airplanes through replacement of metals with the lighter and sometimes more efficient plastics, thousands of pounds of strategic metals were released by the plastics forming process.

Names in the News

J. F. Donahue

H. G. Batcheller

James Fennerty Donahue, vice-president of the Lamson & Sessions Co., Cleveland, Ohio, was honored at a testimonial luncheon and dinner reception April 27, marking his 50th year in the bolt and nut manufacturing industry. The activities were arranged by a committee representing the American Institute of Bolt, Nut & Rivet Manufacturers and were attended by executives of most of the companies in the bolt and nut industry, including members from Canada and Australia.

Hiland G. Batcheller, chief of operations and at one time chief of the Steel Division, War Production Board, Washington, D. C., has resigned and returned to his company, Allegheny Ludlum Steel Corp., Brackenridge, Pa.

Ivan A. Swidlo has been given a citation and emblem for "exceptional civilian service" by the secretary of war. The award is in recognition of engineering achievements in the development and practical application of machine tools for the production of Garand Rifles.

W. F. Sherman

William F. Sherman has been promoted to the position of manager of the Automotive Council for War Production, Contract Termination and Reconversion Division, Detroit, Michigan. **Richard T. Purdy** has been promoted to the position of manager of the Motor Truck division of the Automobile Manufacturers Assoc., and the Military Vehicles division of the Automotive Council for War Production.

R. J. Wysor, until recently president of the Republic Steel Corp., Cleveland, Ohio, was named on May 26 by the Allied Control Council to supervise metallurgical operations in Germany and to see that German steel mills are controlled, dismantled, or moved out of Germany.

Douglas C. Lynch has been granted a leave of absence from Westinghouse Electric International Co., Pittsburgh, Pa., to go to the Philippine Islands, to serve as technical adviser to President Sergio Osmena.

Clarence M. Frazier, vice-president of the Food Machinery Corp., San Jose, Calif., has returned to corporate headquarters after 18 months spent as head of the Peerless Pump div., Los Angeles, Calif.

Frank M. Hawley has been appointed vice-president and general manager and elected to the board of directors of the Morse Chain Co., of Ithaca, N. Y., and Detroit, Mich., division of Borg-Warner Corp. Formerly manager of the Detroit plant, Mr. Hawley has been associated with the company since 1919.

C. Hart Miller

Dr. H. Whittaker

C. Hart Miller has been appointed executive vice-president and general manager by the Republic Aviation Corp., Farmingdale, L. I. Mr. Miller has been with the company since 1935. He became director of the company, vice-president and Farmingdale division manager in 1943.

Dr. Harry Whittaker, diamond expert and former instructor of crystallography at the Massachusetts Institute of Technology, has been appointed head of the Koebel Diamond Tool Co., Detroit, Mich., research department.

Clarence A. Trump has been named resident manager of the Fisher Body Plant, Kansas City, Mo.

W. J. Scott

T. F. Brown

William J. Scott has been named assistant general manufacturing manager of Chevrolet Motor Division, Detroit, Mich. He is a veteran of 30 years of continuous service with Chevrolet.

Tom F. Brown has been appointed assistant general sales manager of Chevrolet Motor Division, Detroit, Mich., in charge of parts and accessory merchandising, warehousing and distribution to succeed **Wendell G. Lewellen,** now an executive of General Motors Corp. Mr. Brown is assisted by **I. W. Thompson** and **John P. Hopkins.**

Francis E. Fairman, Jr., formerly a General Electric executive, has been named manager of the Peerless Pump division, Los Angeles, Calif., of the Food Machinery Corp., San Jose, Calif., and a vice-president of the corporation.

John Mitchell has been appointed manager of the products section of the alloy sales division of the Carnegie-Illinois Steel Corp., Pittsburgh, Pa.

Lonnis Denison has been appointed vice-president and assistant general manager of The Denison Engineering Co., Columbus, Ohio. **Frank C. Norris** was made vice-president in charge of manufacturing and engineering

Frederick G. Schranz has been appointed vice-president in charge of hydraulic and special machinery sales of the Continental Foundry & Machine Co. with headquarters in Pittsburgh, Pa.

John G. Wood, formerly assistant chief engineer in Chevrolet Motor Division, Detroit, Mich., has been advanced to chief engineer. **E. H. Kelly,** former chief engineer of the aviation section, will succeed Mr. Wood.

J. M. Crawford, who has been chief engineer of Chevrolet Motor Div., Detroit, Mich., has been advanced to assistant to **C. L. McCuen,** vice-president in charge of the engineering staff at General Motors Corp.

Adolph G. Schroeder, formerly manager of the machinery and equipment department of Iron & Steel Products, Inc., has become associated with Industrial Plants Corp., Chicago, Ill., in an executive capacity. He has been associated with the machinery industry for 25 years.

Frank W. Godsey, Jr., has been appointed manager of the New Products division of the Westinghouse Electric Corp., Pittsburgh, Pa., to replace **G. H. Woodard,** who has been transferred to South Philadelphia as manager of the corporation's Aviation Gas Turbine division.

BUSINESS ITEMS

General Electric Co., Schenectady, N. Y., plan to erect a new research laboratory nearby to afford 50 percent more space than present facilities provide. The building will cost $8 million and will be built as soon as WPB approval can be obtained.

General Motors Corp., New York, have plans for the erection of an automobile assembly plant at Wilmington, Del., to be built as soon as war conditions permit. The plant will be used for the assembly of Buicks, Oldsmobiles, and Pontiacs.

The Studebaker Corp., South Bend, Ind., has a $2,500,000 program planned which is designed to facilitate the resumption of civilian automobile production.

Calco Machinery Co., Philadelphia, Pa., is the agent in the Philadelphia territory for the **Reed-Prentice Corp.,** Worcester, Mass., line of Vertical and Toolroom Universal Milling Machines.

Ford Motor Co., Dearborn, Mich., is planning an assembly plant and parts depot at Atlanta, Ga., to serve the Jacksonville, Fla., and Atlanta area. The plan is designed for assembly of 350 automobiles daily.

Poulsen & Nardon, Inc., Los Angeles, Calif., machine stamping and die plant, has been purchased by **Solomon Eisenrod,** president of **Lincoln Machine Co.,** Pawtucket, R. I. Purchase price is reported at $1 million.

Colonial Bushings, Inc., has completed moving into new quarters at 21601 Hoover Road, Detroit, Mich.

The Carpenter Steel Co., Reading, Pa., has opened its new Cincinnati, Ohio, warehouse, located at 5137 Vine St., St. Bernard.

A. B. McGehee and **M. D. Sayre** announce the opening of a Detroit office to conduct the business of the **M & S Manufacturing Co.,** manufacturers of screw machine products, located in Hudson, Michigan. **A. H. Smith** will act as sales manager of tne new office to be located at 6432 Cass Ave.

OBITUARIES

Alfred Marshall

Alfred Marshall, for many years employment manager of the Chevrolet Motor Division in Detroit and Flint, Michigan, died May 17 in Tucson, Ariz. Known as one of the most able men in the automotive industry in directing personnel matters, Mr. Marshall was director of personnel in all Chevrolet plants throughout the country.

C. S. Morey, expert and counsellor on hobbing and milling problems, died May 21. Mr. Morey had been associated with the Machine & Small Tool divisions of the Barber-Colman Co., Lansing, Mich., since 1906. During 1943-44 he served as a field engineer for the Tools Division of the War Production Board.

Ellsworth Sheldon, 76, died May 25 at his home in New Britain, Conn., after a short illness. Mr. Sheldon was associated with American Machinist as associate editor for the New England area until his retirement ten years ago. Mr. Ellsworth's original writing experience was on the Deep River "New Era," a country weekly, owned by his father, which carried the Connecticut Valley news of the towns around Deep River.

Verne F. Curtis, 46, died April 25 at his home in Evanston, Ill. He was assistant chief engineer of International Minerals and Chemical Corp., Chicago, Ill.

J. Howard Chambers, 87, former president of Chamber Bros. Co., Philadelphia, Pa., passed on on May 22. Mr. Chambers had served the company for 65 years, 30 of them as president. He retired in 1941.

C. Walter Spalding, former manager of power transmission machinery of the Link-Belt Co., Chicago, Ill., at the company's Ewart plant, Indianapolis, Indiana, died May 25 in Chicago, Ill.

Shop Equipment News

Reed-Prentice Vertical Miller Features Electronic Feed Drive

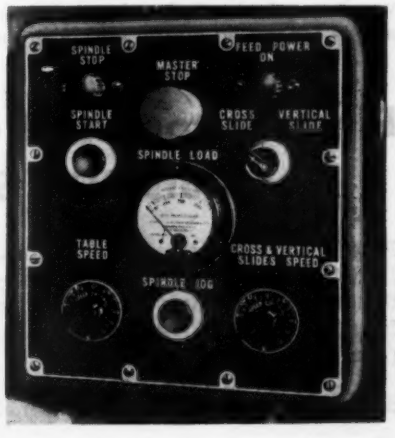
The No. 4 Reed-Prentice vertical milling machine, manufactured by Reed-Prentice Corp., Worcester, Mass., is equipped with electronic feed drive for table, crossslide, and vertical slide (spindle head). Some of the features of this machine and this type of drive are: Centralized pushbutton control station where all the controlling means are located; spindle start, stop and jog pushbuttons; dials for feed rate control; pushbutton to energize the electronic units; emergency master stop pushbutton and a selector.

Centralized operating levers are within easy reach of the operator. There are two sets of levers, each set consisting of an airplane-type half-handwheel and a ball grip lever. The half handwheel gives an infinitely variable feed rate in either direction. The further the handwheel is moved from center or neutral position the higher the feed rate becomes. This arrangement is similar to a servo-control allowing operator to move table or slides with practically no effort. The five position ball-grip levers provide feed and rapid traverse in either direction. The feed rate is constant, preselected and controlled by the position of potentiometers located on pushbutton station.

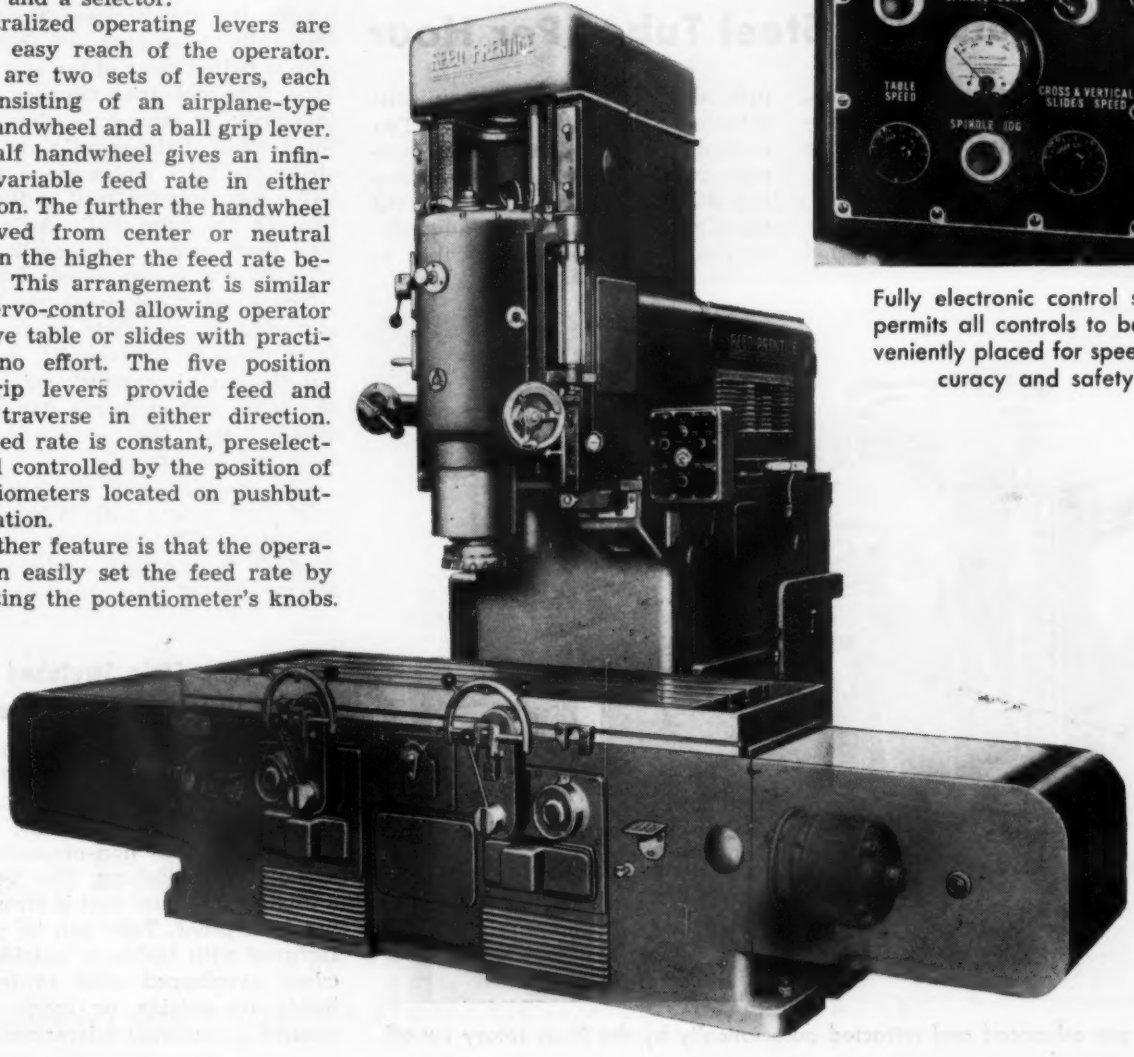
Another feature is that the operator can easily set the feed rate by adjusting the potentiometer's knobs. This enables him to find the most efficient feed while the cutter is in action.

The table, cross-slide, and vertical slide (spindle head) are driven by three 1½ hp., d.c. motors with electronic control to provide infinitely variable feed rates. The range of the feeds is from less than ½ in. to over 25 in. per min., which corresponds to a ratio of 50:1 or more. The electronic units provide full wave rectification, armature control for motor speed below 1330 r.p.m. and field control for motor speed above 1330 r.p.m., plus reversing, overload and undervoltage protection, armature voltage drop compensation to maintain speed within close limits regardless of load fluctuation, and dynamic brake stop from any speed to prevent coasting.

There are two electronic units for the control of the three motors; one unit for the table motor and the other one for the cross-slide and



Fully electronic control system permits all controls to be conveniently placed for speed, accuracy and safety



vertical slide (spindle head) motors. Shift of the latter unit from one motor to the other one is accomplished by means of a selector switch mounted on the pushbutton control station. The electronic units are mounted on a hinged panel and inclosed in sheet metal box of dust-tight type. To insure satisfactory heat dissipation, a blower is mounted inside the box for the purpose of continuous air circulation within the box itself.

Identical control systems are furnished for the table and the slides (cross-slide and vertical slide). Facing the machine, the group of controls on the right is for the table and the control on the left for the slides. Electrical interlocks are provided to safeguard against faulty operations.

Rapid traverse motion is powered by two 3-hp., a.c. motors, one for the table and the other one for the cross-slide, with conventional magnetic reversing control and plugging switches, and is controlled by the five-position power feed lever. A clutch is provided to disengage the d.c. motor from the feed screw when the rapid traverse a.c. motor is energized. This clutch is operated by power feed lever which at the same time operates a cam type master control switch which disconnects the d.c. motor and energizes the a.c. motor. In other words, electrical interlocks and positive mechanical means are provided so that while in rapid traverse the a.c. motor will not drive the d.c. motor. However, the clutch and control switch are so arranged that while in feed the d.c. motor is driving the a.c. motor.

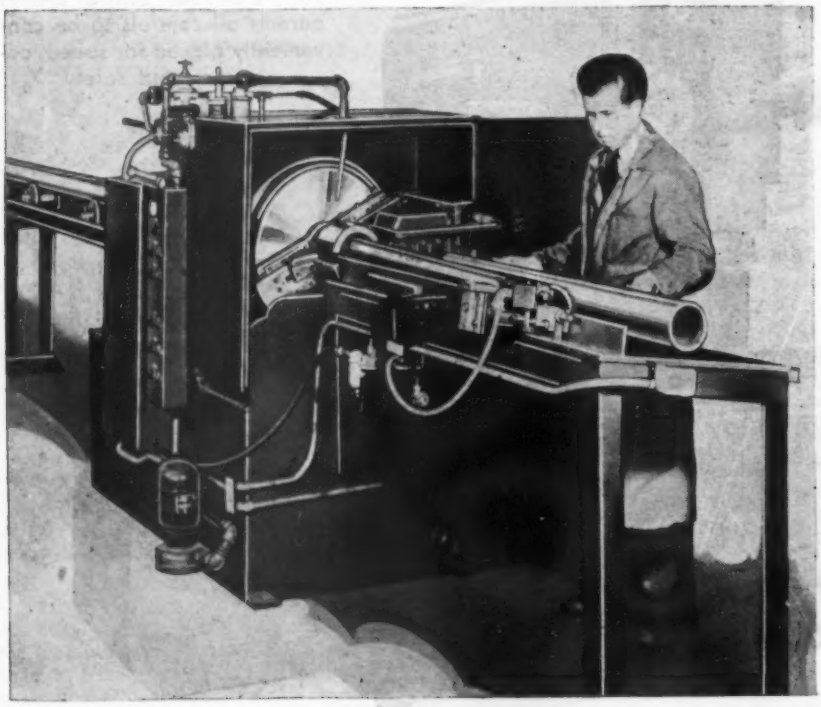
The spindle is driven by a 10 hp., 1200 r.p.m. motor. The capacity of machine is such that it will take a 20 or 30 hp. motor for application of negative rake milling cutters.

Table working surface	24 × 84 in.
Table travel—longitudinal	48 in.
Cross slide travel	23 in.
Head travel—vertical	12 in.
Spindle speeds—18	30-1200 r.p.m.
Table feed infinitely variable	½ to 26 in. per min.
Cross-slide feed infinitely variable	¼ to 20 in. per min.
Power down feed infinitely variable	⅜ to 26 in. per min.
Power rapid traverse—table	180 in. per min.
Power rapid traverse—cross-slide	120 in. per min.
Net weight	20,500 lb.

Pines Automatic Rotary Cut-Off Cuts 400 Steel Tubes Per Hour

Pines Engineering Co., Aurora, Illinois, announces a completely automatic rotary type cut-off machine for ¾ to 5 in. O.D. tubing or 4 in. pipe.

It is equipped with a hollow spindle through which the tubing is fed into a self-centering hydraulically actuated automatic chuck. Two toolholders are mounted on a faceplate carried on the spindle. Pressing a button starts the automatic machine cycle. The tube is advanced by power feed rolls and strikes an air-operated target stop for positioning the end of the tubing for length, the chuck closes, the power feed rolls are stopped and the target stop is pulled clear of the end of the tube. The tools then advance simultaneously by cams on a sleeve over the outside of the spindle until they strike the tube, and a speed control valve regulates the feed of the tools through the tube wall. An adjustable limit switch reverses the tools after the cut is completed.



Tools are advanced and retracted automatically by the Pines rotary cut-off

The chuck then opens, the power conveyor again starts to feed the tube through the spindle, pushing out the cut piece which rolls down the table and strikes a flag switch which brings the automatic target stop back into position.

The machine will cut 5 in. O.D. mild steel tubing with ¼ in. wall at the rate of 200 pieces per hour or 2 in. O.D. tubing with ⅛ in. wall at the rate of 400 pieces per hour.

Spiral Tube Strip Stretched To Develop Higher Strengths

A means of stretching tangential to coiling operations has been devised by the Agalloy Tubing Co., 905 Wheel St., Springfield, Ohio, and is being applied to non-pressure type spirally coiled tubing. The result is a tubular structure that is strong but not leak-proof. Tube can be manufactured with inside or outside fins; edges overlapped with protrusions inside or outside or made open-seamed to accurate tolerances.

"ESPECIALLY GOOD FOR HOLDING TO CLOSE TOLERANCES"

LODGE & SHIPLEY LATHES at work AT R.C.A. VICTOR DIVISION

● **The RCA Victor Division in Indianapolis, Indiana, needed lathes in a hurry for urgent war production—and, luckily, were able to obtain Lodge and Shipley 16" Lathes in a machinery pool.**

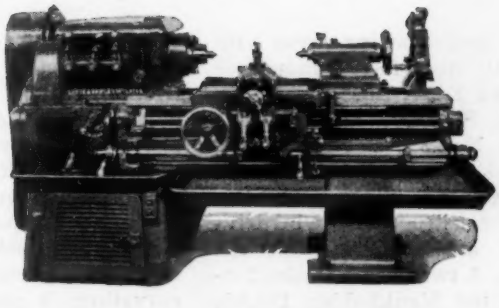
Performance of these L & S Lathes at RCA has been very satisfactory, particularly, in maintaining accuracy on close tolerance work—the real test of a fine tool.

Over 50 years of specialized lathe experience has gained for Lodge and Shipley Lathes international recognition for quality performance.

All of which proves that you can't go wrong when you buy L & S Lathes.

For detailed literature write on your company letterhead for any of the following:

Engine Lathes • Tool Room Lathes • Gap Lathes • Manufacturing Lathes • Duomatic (Automatic) Lathes • Hollow Spindle Lathes.



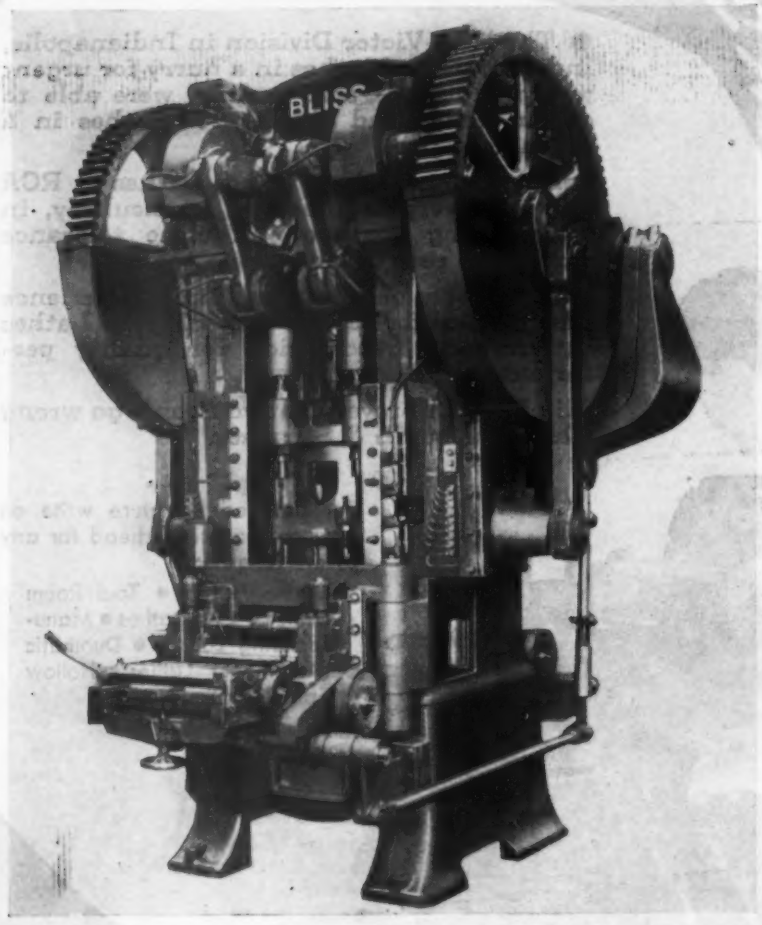
THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI 25, OHIO, U. S. A.

L & S LATHES

ENGINE — TOOL ROOM — AUTOMATIC — OIL COUNTRY LATHES

Bliss Press With Automatic Feed Increases Deep-Drawing Speeds



Automatic operation for press-drawing is provided by the Bliss press, with stock, feed and scrap trimmer for coiled brass or steel

A 125-ton deep-drawing press with an automatic stock feed is manufactured by the E. W. Bliss Co., 53 St. and 2 Ave., Brooklyn 32, N. Y. The press is a No. 3½-B straight-side single-crank toggle drawing press. It is built with a four-piece steel tie-rod frame construction. Twin driving gears are employed on the crankshaft. A twin drive is also furnished on the blankholder. Double gearing is provided. It is also equipped with a Bliss pneumatic friction clutch with electric push button control. An air brake is furnished for stopping the flywheel. Flywheel and driveshaft are mounted on Timken roller bearings. Main bearings are bronze bushed.

The coil stock is fed through a seven roll straightener to remove curvature, a precision double roll feed and a shear type scrap cutter. An automatic stock oiler is attached to the feed. The scrap cutter is furnished with spring holddown and four-edged tool-steel blades. The incoming feed rolls and straightening unit are mounted on a vertical pivot so that they can be swung out of the way for the insertion of the dies.

In a double action press only a comparatively short part of the cycle is available for feeding. In this press, therefore, the feed and scrap cutter are driven by elliptical gears.

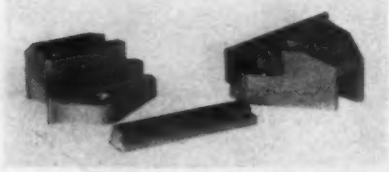
The feed handles a maximum stock width of 18 in., and has a maximum feed length of 18 in.

Plunger capacity at bottom of stroke	125 tons
Crankshaft 6 in. dia. at main bearings, 6½ in. dia. at crankpin	
Stroke of blankholder slide 10 in.	
Stroke of punch slide 15½ in.	
Adjustment of blankholder and punch slide 4 in.	
Distance—bed to blankholder slide, stroke down, adjustment up, 22 in.	
Distance—bed to punch slide, stroke down, adjustment up, 22 in.	
Will draw in depth—7 in.	
Distance between uprights—26 in.	
Area of blankholder slide, respect to largest blank, 20 × 20 in.	

Lanrac Chasers and Holders Simplify Chaser Changing

Landis Machine Co., Waynesboro, Pa. has developed a chaser and chaser holder combination which imparts rigidity and strength to the combination to assure thread accuracy.

The chaser and holders employ a rack tooth arrangement to locate the chaser in its approximate position. The chaser has rack teeth milled for its full length on the offset seating surface and likewise rack teeth are milled on the chaser clamp at the end nearest the chaser cutting edge. When interchanging chasers, the chaser is placed on the holder in its approximate position and clamped

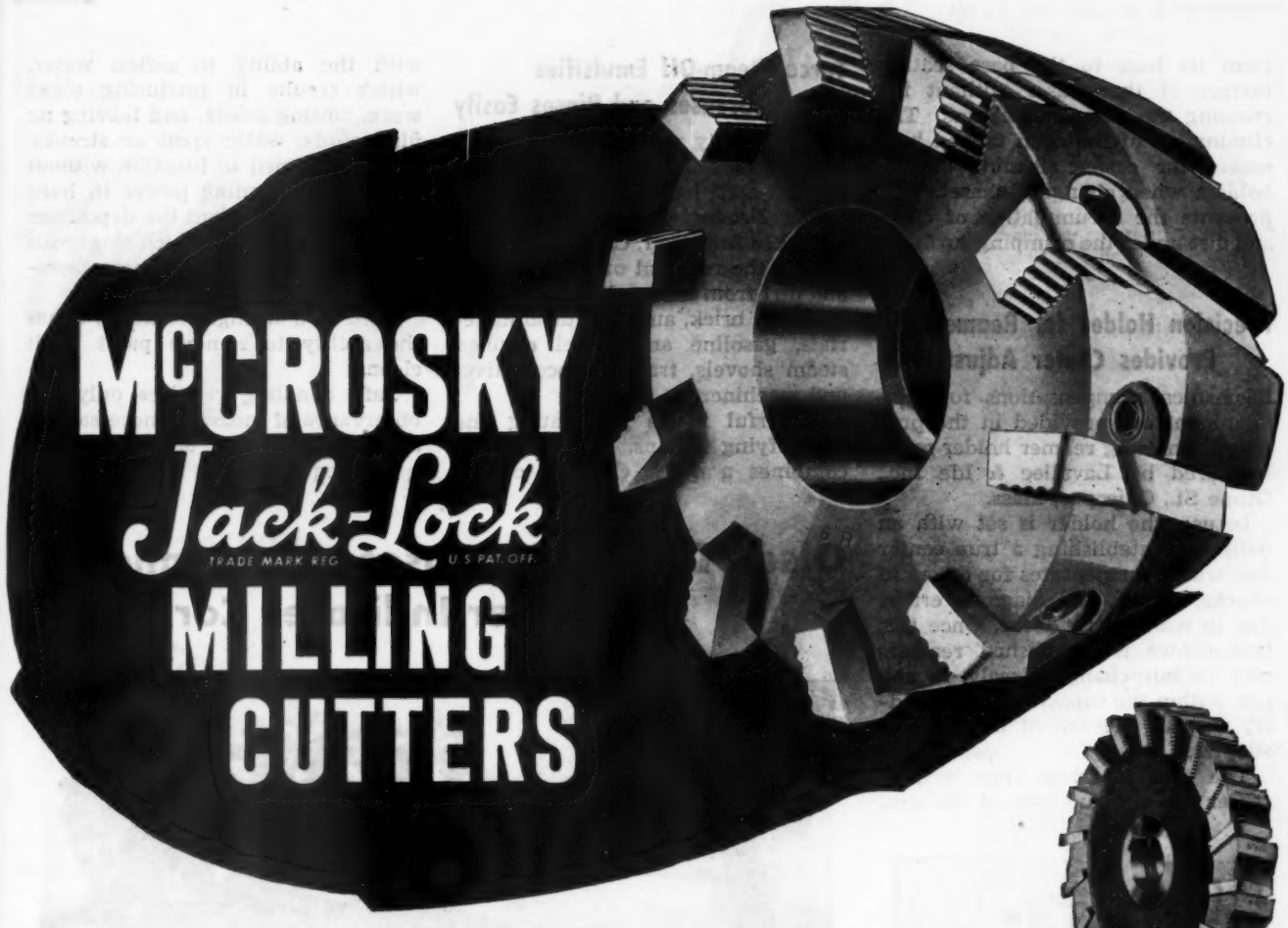


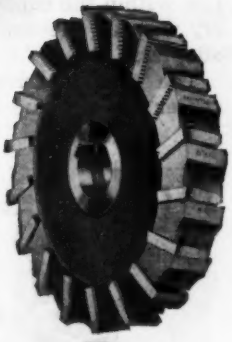
Lanrac chasers can be used with old type chaser holders without the use of the Lanrac type clamp

lightly. An adjusting screw which engages the back end of the chaser clamp is then employed to advance the chaser and chaser clamp as a unit to the exact position. Elongated slots in the chaser clamp permit lateral movement of the clamp slightly greater than the pitch of the rack.

With the clamping arrangement it is necessary to adjust the screw no more than two or three turns at any time.

In addition to permitting quicker interchange of chasers the Lanrac holders and chasers provide greater accuracy and strength since the chaser has approximately 40 percent increased base seating surface, and the elimination of the tapped hole increases the thickness of the holder





FACE, SHELL-END, HALF-SIDE, STAGGERED TOOTH AND "SPECIALS" TO MEET ANY REQUIREMENT

● Conceived, perfected and available only from McCrosky,—Jack-Lock Milling Cutters give users a maximum of long, efficient, satisfactory service. Blades on Jack-Lock Cutters are held rigidly and solidly,—but can be released easily, and without hammering. Fine pitch back-up screws assure accurate and uniform adjustment so that a minimum of blade stock is lost in regrinding, a particular advantage when carbide tips are used. A fewer number of Jack-Lock Cutters will keep a job in continuous production, reducing tool inventories.

Specify McCrosky service-proved Jack-Lock Cutters, and get—in your plant—all the design, construction and operating advantages only McCrosky Jack-Lock Cutters can give you.

McCROSKY TOOL CORPORATION
MEADVILLE, PA.

COST CUTTING TOOLS

Designers and Manufacturers of

Jack-Lock MILLING CUTTERS — *Block Type* BORING BARS

Wizard CHUCKS AND COLLETS

Super Adjustable REAMERS — *Turret* TOOL POSTS

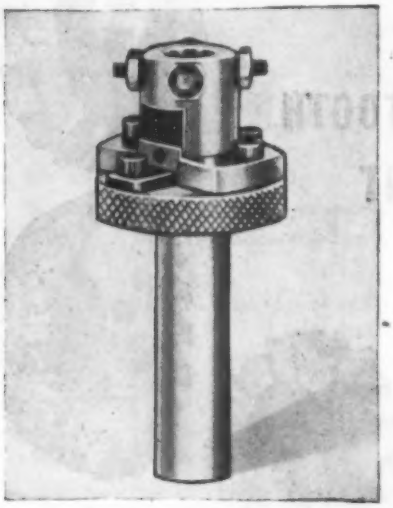
from its base to the base seating surface of the chaser without increasing the overall thickness. The elimination of the open tapped hole makes for easier cleaning of the holders when changing chasers and prevents the accumulation of chips and dirt under the clamping surfaces.

Precision Holder for Reamers Provides Center Adjustments

Mechanical compensations for misalignment are provided in the precision centering reamer holder manufactured by Lavallee & Ide Inc., Grape St., Chicopee, Mass.

In use, the holder is set with an indicator, establishing a true center line which compensates for errors in chucks, turrets and diagonal errors due to worn turret locks. Once this true center is established reamers may be interchanged freely, in any size within the capacity of the holder, without the use of bushings or adapters.

The reamer drives from a dead center on the true axis of the machine, which eliminates bell-mouthing. The lack of weight on the shank end of the reamer stops cramping or tapered holes.



Lavallee and Ide reamer holder is adjustable to misalignments

Uses of the new holder are varied: reaming super-finish holes to very close limits; tapping class 3 fits; threading with self-opening dies; special form reaming; counter-boring; and precision drilling.

Four models and two sizes are available: stub reamer and chucking reamer heads of 1/16 to 7/16 in. capacity and a chucking reamer head, 7/16 to 1 1/8 in. capacity.

Turco Steam-Off Emulsifies Greases and Rinses Easily

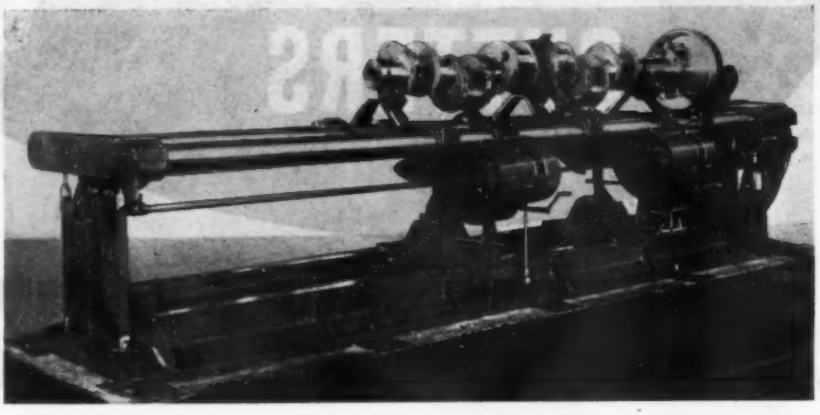
A heavy-duty steam cleaning compound, marketed under the name of "Steam-Off," has been developed by Turco Products, 6135 So. Central Ave., Los Angeles 1, Calif. It is effective in the removal of heavy grease and dirt from iron and steel surfaces, concrete, brick, and structural materials, gasoline and diesel engines, steam shovels, tractors, locomotives and machinery.

Powerful in its penetrating and emulsifying actions, this compound combines a quick cleaning energy with the ability to soften water, which results in producing clean work, rinsing freely, and leaving no film, curds, water spots or streaks. It was designed to function without the loss of cleaning power in hard water, and to prevent the deposition of hard water scale, which clogs coils and other vital parts of steam cleaning machinery.

Used as a stronger solution, it has the ability to remove paint as it cleans.

Safe handling requires only the observance of measures necessary to all steam-cleaning operations. No special equipment is necessary.

Olsen Dual Compensator Dynamic Balancer Indicates Correction



Indicating compensators of the Olsen dynamic balancer are arranged to fix the points of unbalance and to retain the correction reading, thus permitting corrections to be made without calculation

The type S dual compensator balancing machine, manufactured by the Tinius Olsen Testing Machine Co., 500 N. 12 St., Phila. 23, Pa., is designed to indicate the points and amounts of dynamic unbalance of crankshafts and long parts.

This machine has a weight range up to 5,000 lbs. and will handle crankshafts or other parts up to a maximum of 15 ft. from one end of the shaft to the opposite end bearing surface. The machine will swing a maximum diameter of 42 in.

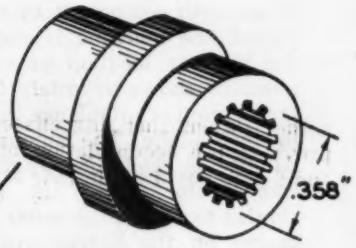
This type of machine employs two compensators; one located on each cradle pivot bracket so that a compensator can be located in each of the two correction planes selected. Each compensator is controllable electrically from the centrally located control panel and may be shifted angularly and also the unbalance can be changed; all while the machine is running.

The operation is comparatively simple since the vibratory cradle carrying the crankshaft is restrained to oscillate about either of the two pivots which, when locked, act as a center for oscillation of the cradle. The locking pivot in the plane of correction, the effect of any unbalance, or future corrections in this plane, will not affect the reading obtained in the other plane and this reading is taken directly from the compensator in that plane. By interchanging locked pivots, readings of angle and amount of unbalance can be taken in both planes at one run without stopping the machine. Entire operation of adjusting the compensators is made visual by means of the high tension spark dial which shows, at all times, the relative location of unbalance in the work and the compensating unbalance.

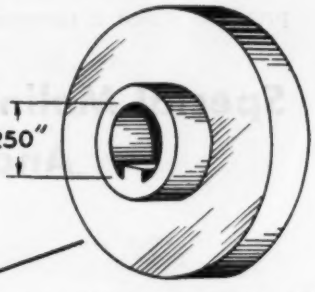
Each compensator is adjusted in both angle and amount of unbalance

They're Everyday Jobs for the "Junior"

PULL BROACHING
(With Pull-Down Attachment)

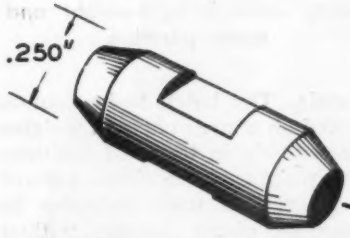


Broaching small splines in lever hubs.

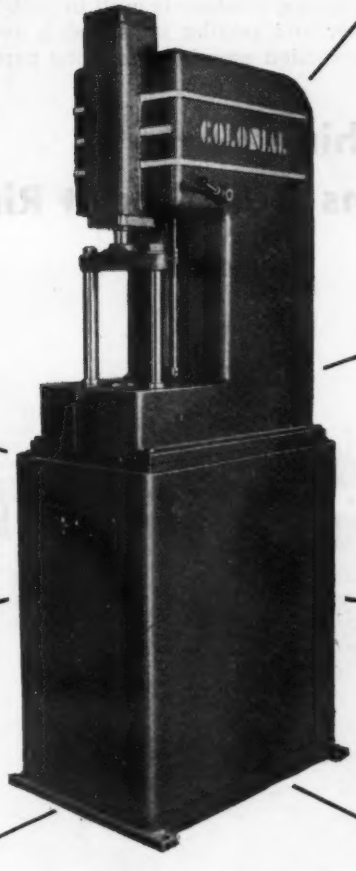


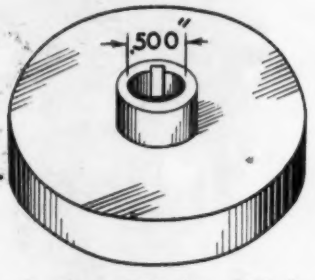
Broaching inverted .062 key in ¼" hole, ½" long.

PUSH BROACHING

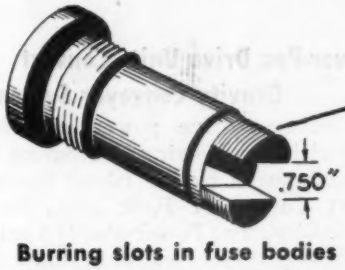


Straddle Broaching ¼" wide flats on ¼" diam. pivot pins.

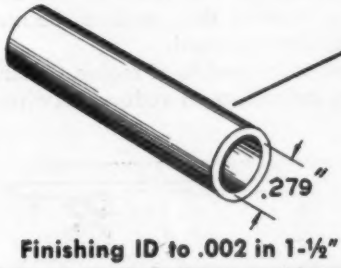




Cutting .155 by .070 keyway ¼" long in ½" hole.



Burring slots in fuse bodies after turning and threading.



Finishing ID to .002 in 1-½" long seamless brass tubing.

Removing .004 to finish a ½" hole, ¾" long.

In practically every shop there are "little" jobs—assembly, broaching, etc.,—which the Colonial "Junior" Press—with or without pull-down attachment, base type or bench type—can do quicker and better. Full hydraulic—available with variable speed and pressure controls. Capacities 1 to 4 tons; 12 inch stroke.

Ask for Bulletin #VJ1-44

colonial BROACH COMPANY
DETROIT 13, U.S.A.

Broaches — Broaching Machines - Broaching Equipment

to neutralize vibration of the cradle caused by unbalance in the work. When both compensators are so adjusted, the machine is stopped and the angular location of each compensator shows definitely the angular location of unbalance in the work in each plane. The amount of unbalance is read directly from each compensator which is graduated similar to a microammeter, with the coarse on the barrel and the fine graduations on the cap.

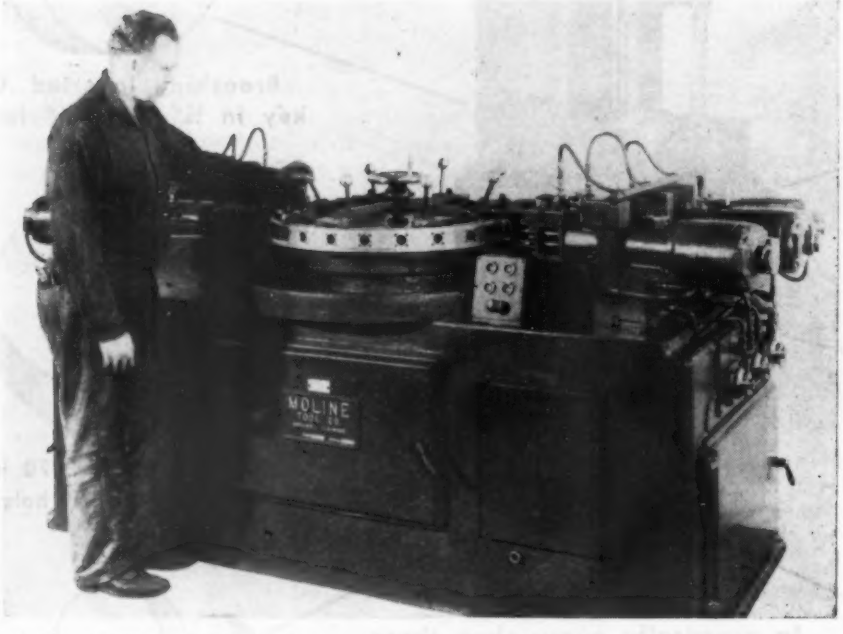
Each compensator has a maximum unbalance capacity of 1,000 oz. in.

A center support bearing can be provided which is necessary in balancing long, slender parts such as diesel crankshafts. This center bearing prevents whip of the shaft which would make it impossible to balance such a shaft dynamically on only the two end bearings.

The machine is quickly changed over to accommodate different sizes of shafts within the range of the machine and the direct readings of the compensator in oz. in. in each correction plane eliminates any involved computations.

This type dual compensator balancing machine is built in both larger and smaller sizes and is recommended especially for long parts.

Special Moline Machine Bores And Reams Gun Mount Ring



Moline Tool Co. M32 special machine bores and reams all holes in the inner ring of a gun mount

One of several automatic machines produced by Moline Tool Co., Moline, Ill., for work on aircraft gun turret rings, the M32 has features which are applicable to machining problems presented by other metal parts.

The part to be machined in this case is an aluminum ring and the M32 automatically drills and reams 24 groups of four small holes. At the same time it finish bores and chamfers a larger hole located at the center of each group and which was drilled during a previous machining operation.

There are two four-spindle drilling units, two four-spindle reaming units and two single-spindle precision boring units on the machine. Each unit has its own hydraulic feed cylinder and feed rate regulating valve.

Complete automatic electric control renders skill on the part of the operator unnecessary since all he has to do is load and unload the work from the fixture. During the cycle the work is indexed automatically by hydraulic power to bring each group of holes into proper relationship with the tools as required.

Complete safety interlocking of the electrical, mechanical and hydraulic functions prevents trouble such as might occur if the reamers were fed into the work where no holes had been drilled previously.

Counting Scale Indicates Number of Parts Directly

A scale to count parts by direct reading is announced by J. H. Keeney & Co., 6610 So. Ashland Av., Chicago, Ill. A single piece of the lot to be weighed is placed in a small pan on

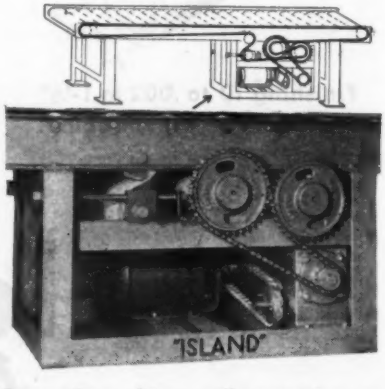
Keeney scale is light-weight and easily portable

the scale. The batch to be counted is placed on a large pan and weighed comparatively in terms of multiples of the weight of the single controlling piece. The scale indicates the number of pieces directly without weight or other calculations. The accuracy of the reading depends on the variance in part weights.

Power-Pac Drive Units Convert Gravity Conveyor Systems

A conveyor-drive power unit for motorizing conveying equipment is manufactured by the Island Equipment Corp., 101 Park Ave., New York City. The Power-Pac is a self-contained assembled unit, built in an iron frame, ready to be bolted to the chassis of any piece of conveying equipment that needs to be mechanically operated.

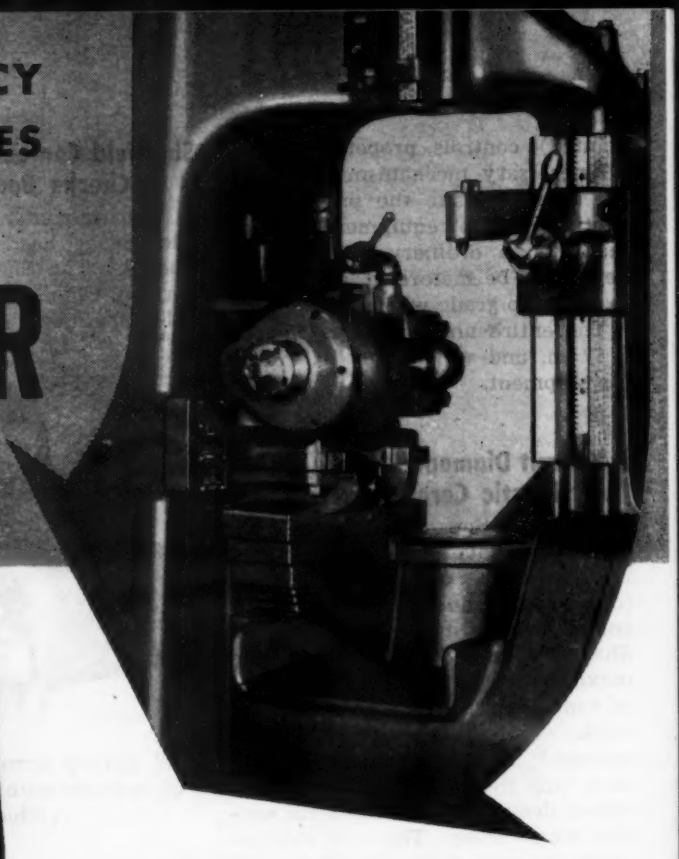
The unit consists of motor, driving rolls, switch speed reducers (where

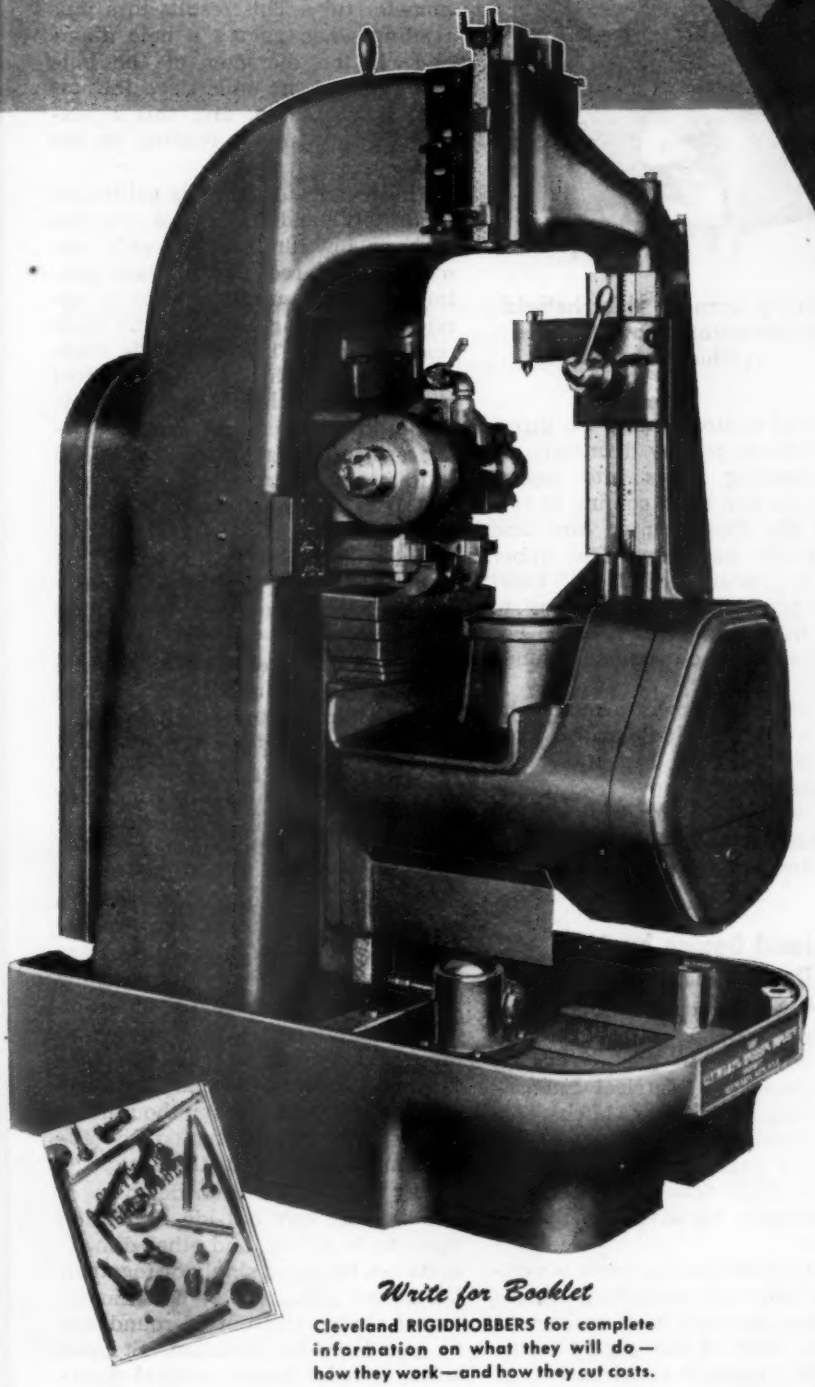


Power-Pac drive will motorize a gravity conveyor table of any length or width

RIGIDITY ASSURES ACCURACY OF HOBBED GEARS & SPLINES

The RIGIDHOBBER

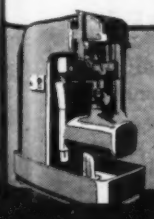




● Rigidity is the keynote of Rigidhobber design and construction. For example the "O" construction which provides maximum rigidity by supporting the work head both above and below work. The workhead moves vertically and hob cuts against its entire weight eliminating backlash between lead screw and nut. This sturdy construction eliminates any spring in the work or the hob and assures the utmost in the precision of duplicate work. Modern electrical control permits rapid traverse motion of the workhead to hob, feed motion through the cutting portion and rapid traverse back to loading position by means of a single push button. The machine does not require specially skilled help.

Write for Booklet

Cleveland RIGIDHOBBERS for complete information on what they will do—how they work—and how they cut costs.



The CLEVELAND HOBBING MACHINE Company

General Offices:
1311 CHARDON ROAD
CLEVELAND 17, OHIO

Chicago Office:
624 S. MICHIGAN AVE.
CHICAGO 5, ILLINOIS

wanted), controls, proper gears and all necessary mechanism to enable the user to make the proper connections to their equipment. In this manner, an ordinary gravity conveyor can be motorized, allowing it to carry up grade where needed.

The entire unit measures 15 × 24 × 17 in. and weighs 167 lb. crated for shipment.

J. K. Smit Diamond Wheels With Plastic Cores Easy to Dress

J. K. Smit & Sons, 157 Chambers St., New York, have developed two diamond wheels. One does a special form grinding job—the other sharpens all types of multi-bladed cutters. Shapes of these two wheels provide maximum clearance and a minimum of contact area between wheel and work. With the diamond section mounted on the periphery of the core, only the inside of the core requires dressing as the diamond section wears away. The core may be easily cut away with a dressing stick.

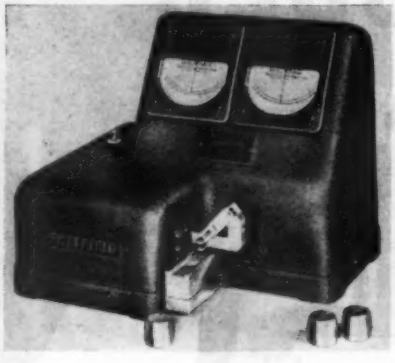
Type 660B, the shallow dish wheel, is capable of grinding accurately and holding form in sharp corners. Rigidity provided by the Bakelite body allows for the performance of delicate operations at high speeds. Available in standard 6 in. dia.

Type D11B, the flaring cup wheel, is designed for general tool and cutter grinding. Cutting efficiency is due, in part, to the rigidity of the solid body construction. Various resinoid bonds are supplied to meet requirements: BD bond for fine carbide-tipped, reamer-flute grinding; BC bond for intermediate size carbide-tipped cutters; and BV bond for larger cutters and heavy stock removal. Manufactured in 3, 3¾ and 5 in. diameters.

Diamond-loaded periphery of the Smit wheel provides for minimum contact area of wheel to work

Sheffield Contour Comparator Checks Bearings Electrically

A bearing contour comparator with Electrigage heads has been developed by The Sheffield Corporation, Dayton, Ohio. The gage checks barrel-shaped bearing rollers for correctness of contour only. No direct check is made on any diameter.



All gaging arms of the Sheffield contour comparator have tungsten-carbide tips

The bearing slides into gaging position on two rails, coming to rest against the fixed center arm and lower roller backstop. The upper roller is spring-loaded to exert enough pressure on the bearing to keep it in gaging position while being rotated for the complete contour check.

The upper and lower arms do the gaging while the middle arm is fixed for positioning the bearing roller. The gaging fingers move reed mechanisms which in turn actuate the Electrigage heads. The middle arm is adjusted for various contours.

Dimensional Gaging by Air Devices Achieves Accuracy

Federal Products Corporation, Providence, R. I., are exclusive agents for an air gaging system manufactured by Metrical Laboratories, Inc., Ann Arbor, Mich. This system consists of a graduated column and a gaging head. A manometer tube, built into the water column, indicates variations in the air pressure.

The standard gaging head is constructed with two measuring orifices which are recessed with respect to the outer skirt of the gaging member. This recessed construction of the orifices of the gaging head permits a part whose surface is easily marred to be precisely gaged without the surface of the part actually touching the gaging member. This recessed design of the gaging head contributes to the maintenance of operating accuracy, due to the fact that the protective outer skirt of the gaging member can wear considerably before the two measuring orifices themselves show signs of wear.

As the space between the measuring orifices and the part being gaged increases, the air flow increases and the water column rises in the manometer tube. This results in a plus reading when gaging a hole diameter. If the diameter of the hole being gaged is undersize, the air flow is decreased, and this is expressed by a minus reading on the scale.

The metricator scale is calibrated accurately and does not require high or low limit gages, only one master being required for each gaging head. When this master is applied to the gaging head, the scale reads at zero. The master is made of high grade chromium-plated tool steel lapped to dimensional accuracy. By building a reduced size measuring orifice, holes as small as 0.156 in. dia. and shoulders as narrow as 0.0937 in. can be precisely measured. Slots and grooves can be gaged from 0.0937 in. thick and up. Gaging heads in general will measure external diameters from 0.500 in dia. up.

Federal Metricator Air Gaging System operates under air pressure of approximately one pound. The system can be attached to the regular plant air supply. If attached to a high pressure line, a regulator at the instrument will bring the pressure down to the proper level. Variations in the air line pressure do not affect accuracy of readings on the scale, as the pressure in the gaging system can be kept constant by maintaining the water in the instrument at the proper static level.

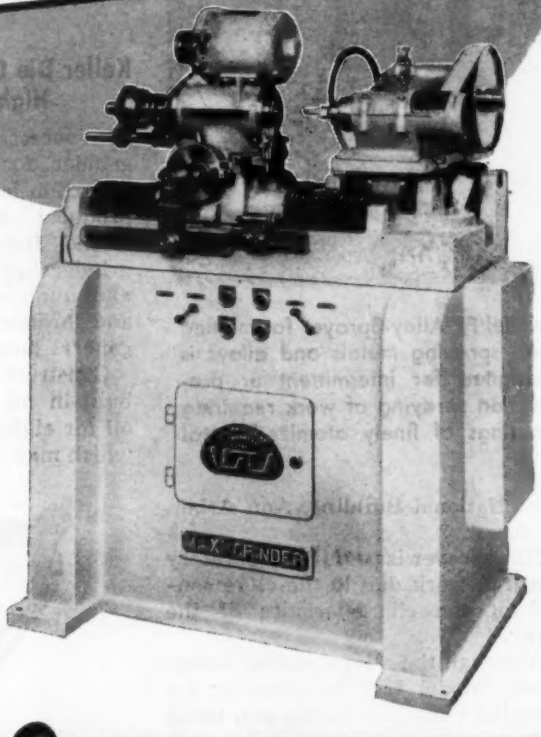
Amplification is four thousand to one, which means that measurements within 0.000025 in. are readable on the scale. One ten thousandth of an inch is represented by approximately ½ in. on the scale.

Any inside dimension down to ⅛ in. dia. and any outside dimension down to ¼ in. dia. and other dimensions can be gaged singly or together. Diametral pitch, taper, bell mouth, barrel shape, and out-of-round can be gaged in one operation. Stepped holes, or holes having several diameters can be measured simultaneously by using a composite gaging member.

Moisture or sludge in the air line does not affect reading accuracy.

Here is An Innovation In INTERNAL GRINDER DESIGN *that offers*

WIDER RANGE
SIMPLICITY OF OPERATION
SPEED and PRECISION



Choose the Maxi-GRINDER for ultra-finish and extreme accuracy on *any* internal grinding operation. The features listed below qualify this unit for your toughest jobs.

Convenient grouping of controls leaves operators right hand free for loading and unloading work head.

Entirely automatic collet opening and closing.

Mechanical differential unit drives grinding-spindle carrier —eliminates bell-mouth holes.

Easily adjusted stroke length adapts unit to shoulder and blind hole grinding.

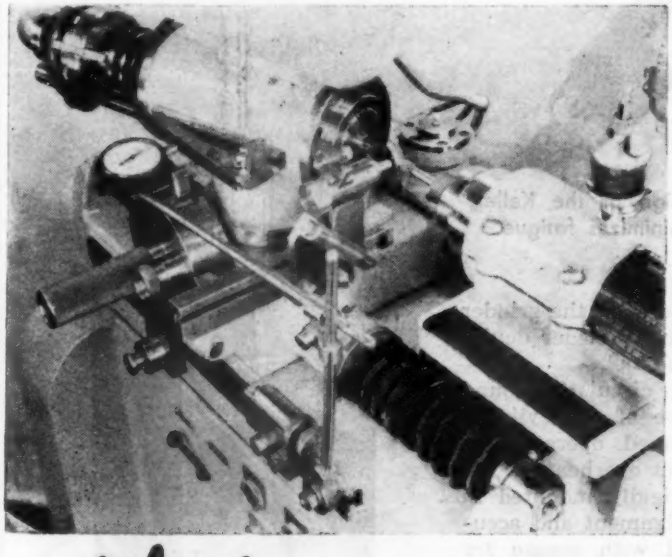
Six spindle speeds, can be slowed quickly for wheel dressing.

Micrometer feed on diamond wheel dresser quickly adjusted.

Totally enclosed feeding mechanism is free of backlash, protected from dust.

Built in sine bar simplifies taper and angular hole grinding.

Separate motors provided for each operation. Push buttons control all functions.



Wilson MACHINE PRODUCTS CO.
1231 Beaufait Ave.
DETROIT 7, MICH.

Order your copy of the new *Maxi-GRINDER* Catalog . . . no obligation

Please send the new Maxi-Grinder Catalog to me at once.

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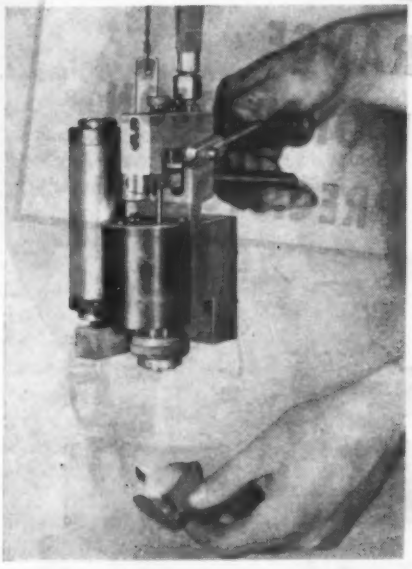
Low-Temperature Alloy-Sprayer Provides Exact Coating Control

A self-contained "Alloy-Sprayer" built especially for precision spraying of low-temperature metals and alloys is added to its line of metal atomizers by Alloy-Sprayer Co., 602 First National Building, Ann Arbor, Mich.



Model FP Alloy-Sprayer for melting and spraying metals and alloys is designed for intermittent or production spraying of work requiring coatings of finely atomized metal

This sprayer is useful in laboratory research work due to the close control of the characteristics of the spray.

Although the alloy-sprayer, designated "Model FP", is primarily for spraying vertically downward, being suspended on a chain or similar support, it can be swung out to spray almost horizontally. It can be used for virtually any type of spraying on a production basis or as a laboratory instrument.

The sprayer is equipped to permit instant selection of quantity of spray. The application of alloy or metal can be made in three stages: fine spray, coarse spray and pour. Moreover, the degree of fineness of spray in each stage can be varied by means of an adjustable needle valve. Both stages of spray are accomplished with air pressure on, while the pouring is done with air pressure cut off entirely.

Spraying is accomplished by grasping the handle and pressing the lever. A smaller auxiliary control is moved by the thumb to change from fine, to coarse, to the pour stages of spray. Design of the sprayer eliminates the possibility of oxides plugging the nozzle. Use of stainless steel eliminates corrosion and the subsequent formation of scale and also reduces possibility of the contamination of metals.

A feature of the sprayer is that metal can be added without interrupting the spraying operation. Metal can be added intermittently as needed and does not need to be in special form.

Range of operation of the Model FP sprayer is 100 to 600 F. Alloy in almost any form is melted in the pot preparatory to spraying by means of thermostatically controlled electrical elements.

Keller Die Grinder Maintains High Torque at High Speeds

An increased-power pneumatic die grinder for continuous high-speed operation is a recent addition to the products of the Keller Tool Co., Grand Haven, Mich. The Keller grinder has a one-piece housing of aluminum alloy with head, muffler, and throttle lever blending with the general housing contour.

Construction features include the built-in oil reservoir, which holds oil for eight hours of operation, and which may be filled by removing one screw. Oil is metered to the grinder through an automatic feeder device incorporated in the tool.

Hand-fitting design of the Keller die grinder minimizes fatigue

Cool exhaust air circulates around the finned surface of the cylinder permitting continued operation at high speed without overheating.

Bearings are rigidly mounted in end plates for alignment and accuracy and packed with grease for 1,000 hours of operation. A special shield keeps grease in the bearings and grit and dirt out.

Three models are available—Model No. 1505A—equipped with collet chuck for holding mounted grinding wheels with ¼ in. dia. shanks; Model 1505B — equipped with adapter for holding unmounted grinding wheels with ¼ in. dia. holes; Model No. 1505C—equipped with ¼ in. Jacobs chuck—designed especially for small, light drilling at high speeds.

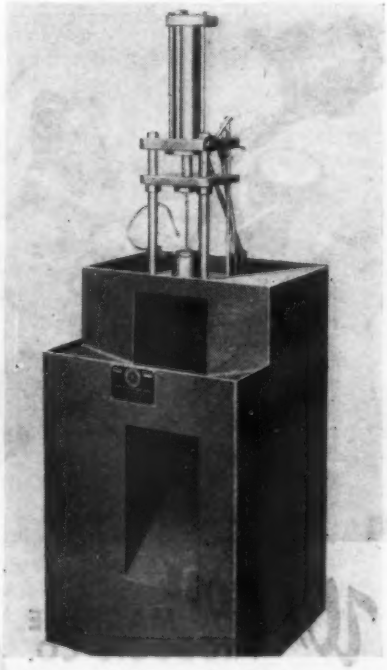
Speed of all models is 25,000 r.p.m.; length 6¾ in.; weight 18 ounces.

Zagar Vertical Broaching Machine Broaches Small Parts

Zagar Tool, 23880 Lakeland Blvd., Cleveland 17, Ohio, are the manufacturers of a vertical broaching machine with a 10 in. stroke. It is built with three guide bars, similar to a three-post die shoe. Consequently, the broach will be pushed straight without any deflection in the machine column.

The broach is pushed with a cone-shaped cup which is located in the top adapter plate and which mates up with a 45 deg. angle ground on the pushing head of the broach. There are no broach-holders or attachments to fasten the broach. The broach is pushed through the work and is then carried back up to its original position to repeat the cycle.

The machine is powered with a 1 hp. motor and has a built-in coolant tank, Cuno oil filter. Broaching pressure is 2000 lb. at 25 ft. per min. Height is 72 in. and the base is 25 in. square.



Zagar broaching machine contains all working parts within the base

Even in America this vast and varied stock of standard size gages is unique.

And—it enables us to give you unique service. Every order received by mail, wire, phone up to 4 p.m. is shipped the same day—any type, any standard size, any quantity.

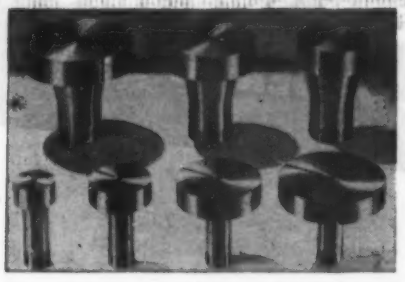
Every Cadillac gage is a masterpiece of the gage-maker's art. This basic material—steel or Stellite—is especially formulated. It is fabricated upon the newest high-precision machinery. Every gage is meticulously inspected to insure that accuracy for which Cadillac Gages are famous. There are none finer!

Phone Us
REVERSE THE CHARGES!
Your inquiries are welcome. Phone us regarding any gaging problem whatever —reverse the charges.

Cadillac GAGE COMPANY
20316 HOOVER ROAD • DETROIT 5, MICHIGAN

Over-capacity Step Collets Adapt Fixtures to Larger Jobs

The over-capacity step collets manufactured by Zagar Tool, 23880 Lakeland Blvd., Cleveland 17, Ohio, are made of M-tempered tool steel finish ground complete and delivered in the soft condition to permit the customer to finish to suit the requirements of individual jobs. They are made in sizes to fit 1 in. and 2 in. fixtures. The 2 in. collets can be used only in Zagar tools; the 1 in. type can be used wherever a type C collet will fit. Both types are made in 3, 4 and 5 in. oversizes and the 1 in. collet is made also in a 2 in. oversize.



Over-capacity treads on collets permit use of standard fixtures for oversize parts

Portable Desk for Shop Use Provides Space for Necessities

A portable desk adaptable for shop foremen, shipping clerks, inspectors, dispatchers and others, is being marketed by Lyon Metal Products, Inc., Aurora, Ill. The portable model No. 2131-15 stands on 3-in. swivel casters and has a positive brake attachment. The overall size of the unit is 34½ in. wide, 30 in. deep and 53 in. high (43 in. high in front). The desk hood provides space for the storage of working papers and has a smooth 30 in. desk top with a 3 in. overall slope. The drawer, 24 x 28 x 3½ in., is equipped with a lock.

Other models also available include the counter type model (no legs); cabinet desk; desk high type; stationary type, and a model which fastens to the wall.

All-metal construction of the Lyons desk makes it suitable for general shop use

Portable Lubrication Station Provides One-trip Service

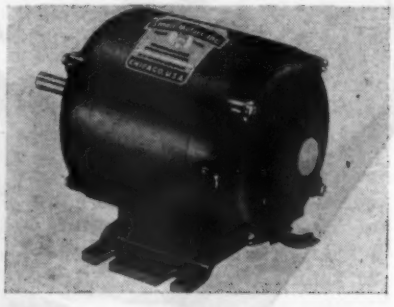
Designed to provide complete portable lubrication for industrial plants, with ability to transport and dispense a variety of grades or types of lubricants, the Lubrikart has been announced by the Alemite Division, Stewart-Warner Corp., 1826 W. Diversey Pkway, Chicago, Ill.

The unit, mounted on 5 in. ball-bearing casters, is 21 in. wide, 31 in. long and 37½ in. high. Pushed like a perambulator, it is intended for one-man operation and is able to travel between rows of machines or elsewhere in a plant where space is limited.

Alemite Lubrikart is equipped for complete machine lubrication

The basic model carries two 7-gal. tanks equipped with low-pressure pumps with a 5½ ft. hose and non-drip nozzles for filling oil reservoirs on machines or hydraulic systems, and for filling gear housings; one 7-gal. tank with high-pressure pumps for loading handguns; two 1¾-gal. tanks with oil-transfer pumps for filling oil cans; six spout-type oil cans and four lever-type handguns. There is also space for waste, replacement fittings, small tools or other material.

The second model has, in addition to the foregoing equipment, a high-pressure, hand-operated grease pump which holds 30 lb. of lubricant and has a 5½-ft. lubricant hose fitted with a hydraulic coupler. This pump develops up to 7,000 lb. per sq. in. pressure and can be lifted clear of the Lubrikart and carried to point of use. All pumps, loaders and transfers are manually operated.



Small motor has low weight for output, requires small space

Universal Appliance Motor Delivers Fractional H.P.

The SM-4 fractional horsepower motor, developed by Small Motors Inc., 1308 Elston Ave., Chicago 22, Ill., is intended to provide a power source with a low weight to hp. ratio in a minimum of space. They are available in a.c.-d.c. types with ranges of 1/50 to 1/10 hp. Units are 3 5/16 in. dia., 4 13/16 in. length, 3⅞ in. height with rigid base. Weight is between 3 and 4 lbs., varying with the rated horsepower and type of mounting installed.

Copper or Alloys Welded With Alternating or Direct Current

The Eutectic Welding Alloys Co., 40 Worth Street, New York 14, N. Y., manufacturer of low temperature welding rods, has introduced a new electrode for arc welding. Known as EutecTrode 28, the electrode is a coated special bronze alloy to be used for the arcwelding of bronze, brass and copper. The electrode is shielded with a flux coating that makes it suitable for use either on a-c or d-c. It will deposit metal that is a good color match to most types of bronzes. It will give the welded area substantially the same corrosion resistance as the base metals possess. It may also be used for welding copper and brass or joining these metals to steel, cast iron, or nickel alloys, and for overlaying steel or cast iron to provide a bearing surface. It is available in ⅛ and 3/16 in. dia. rods.

THIS IS KNOW-HOW IN BRASS

by Revere

Brass, whether in the form of plate, sheet, strip, rod, bar, tube, pipe or special shapes, can be no better than the original casting from which those products are fabricated.

That is why Revere exercises the most careful control over this basic process. That control begins in the laboratory and is carried through to the finished product. In many cases Revere engineers have worked out original methods. Through analyses of test specimens from every melt, through detailed supervision of workmen, and through careful training of those workmen to the meticulous Revere standards of craftsmanship, we and you are assured that every casting is absolutely right and will produce sound products for you.

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REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

Executive Offices: 230 Park Avenue
New York 17, N. Y.

1. *Charging the furnace*
2. *Taking test sample of melt*
3. *Pouring a sound slab*
4. *Sawing gate off cake*
5. *Slabs ready for rolling*

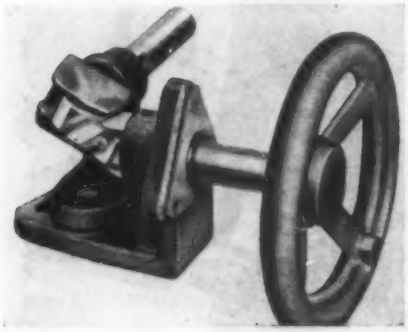
Parts and Materials

Revere Tellurium-Bearing Copper Rod Machines Easily

A free-cutting copper rod of the tellurium bearing type has been added to the product list of Revere Copper & Brass Inc., 230 Park Ave., New York 17, N. Y.

This is oxygen-free, high conductivity copper containing a small amount of tellurium, which greatly increases the speed with which the metal can be machined, makes closer tolerances possible and improves the finish of the completed parts.

Free-cutting copper machines to brittle chips which break readily and clear from the tools without special attention, in contrast to the long, tough stringers characteristic of electrolytic copper.



Handwheels can be provided with the Piezo universal link joint

Piezo Link Joint Provides Constant Speed for Controls

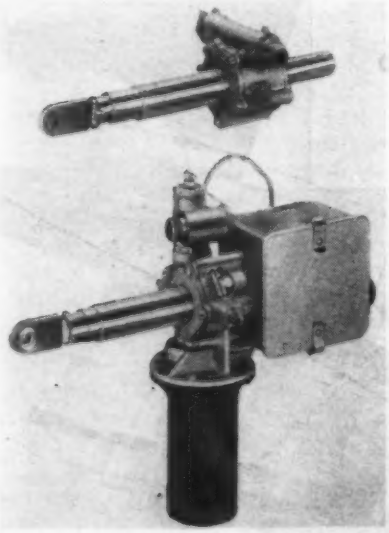
The Piezo universal link joint, is a remote-control product of the Piezo-electric Corp., 110 E. 42 St., New York 17, N. Y. It has an adjustable link mechanism to transmit rotary motion around corners, permitting the operation of shafts at angles from a straight line to a right angle. A feature of this Piezo joint is the fact that the output shaft turns in the exact angular rotation as the input shaft, giving an input turning angle equivalent to the output turning angle. This is of importance in dial settings and where uniform motion is desired.

The joint is mounted by means of three screws which hold it in position. The bearing arm which holds the adjustable shaft may be hinged to any desired position from 0 to 90 deg. and when in its proper location, a locking screw permanently holds its position. It is recommended by the manufacturer for hand operation and slow speed power drives, such as those used in the control of electrical switchboards, radios, automatic machinery, valve operation and other mechanical devices.

Dual Linear Actuators Are Synchronized for Heavy Loads

Dual operation is possible with two linear actuators manufactured by Foote Bros. Gear & Machine Corp., Chicago 9, Ill. The primary actuator is powered by a 1/6-hp. electric motor. The secondary actuator (motorless type) gains its power from the primary by means of a flexible shaft coupling which synchronizes the two units.

Both actuators have a linear action of 5 in. at an extension speed of 12 sec. and a retraction speed of 9 sec. Travel of the screwjack is accurately controlled by limit switches and stops may be adjusted by a single screw. These two models are capable of handling working loads up to 750 lb. with a static load capacity of 2500 lb.



Magnetic brakes and worm gear prevent vibration creep in Foote Bros. dual linear actuators

The 1/6 hp. motor of the primary unit operates at 8000 r.p.m. from 26 volts d.c. at 11½ amp. and is equipped with a magnetic brake for instantaneous stops and to prevent the gear train from creeping due to vibration.

The primary reduction spur gears, steel worm and screwjack are hardened for accuracy and long operating life.

Dimensions of the motorized actuator are 13 in. long, 11 in. high and 4-15/16 in. wide, weight 7 lb. The shaft driven model is 10 11/16 in. long, 3½ in. high, 3¾ in. wide and weighs 3 lb. The latter may be used separately by driving off an engine or other source of power.

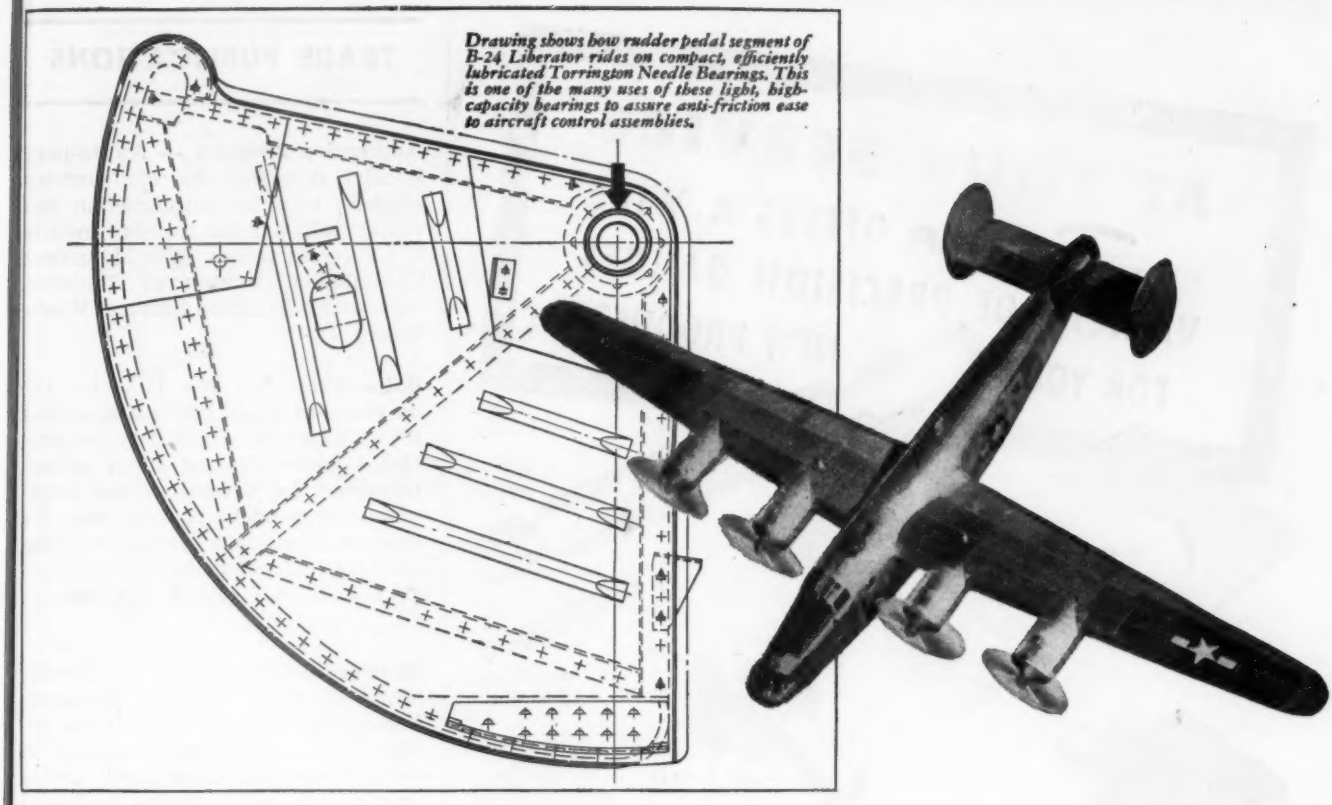
Parker-Kalon Socket Setscrews To Be Ground by Landis Method

The centerless thread-grinding method developed by the Landis Tool Co., has been adapted to the quantity production of socket setscrews by the Parker-Kalon Co., 200 Varick St., New York, N. Y.

This ground-thread setscrew is said to be a material improvement over the conventional socket setscrew in finish and accuracy. The threads are ground on hardened blanks which increase strength. They are free from the nicks, burrs, and hardening cracks common to cut threads.

When enlarged in the comparator, the contour and lead of the ground threads conforms to standard with a degree of accuracy stated to be hitherto unknown in a stock setscrew. A uniform Class 3 fit is assured.

Ground thread screws have been made heretofore for fine precision equipment, but at a cost which prohibited their use for the average assembly. By this process, screws equal in quality are made to sell at a price no higher than for ordinary cut thread socket setscrews. Equipment is now being installed by Parker-Kalon to produce the ground-thread setscrews in standard sizes.

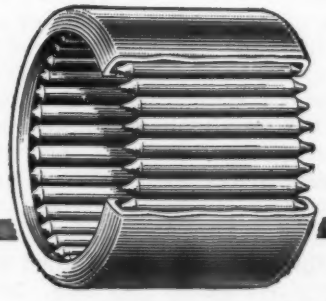


Drawing shows how rudder pedal segment of B-24 Liberator rides on compact, efficiently lubricated Torrington Needle Bearings. This is one of the many uses of these light, high-capacity bearings to assure anti-friction ease to aircraft control assemblies.

Rudder Pedal Segment of B-24 Liberator Rides on Torrington Needle Bearings

It is no surprise that the rudder pedal segment of the mighty B-24 Liberator, rides on light weight, compact Torrington Needle Bearings. For their full complement of small diameter needle rollers packs high capacity into small space, provides an extra margin of safety with the efficiency and reliability that is characteristic of these modern, self-contained anti-friction bearings.

Can you visualize these Torrington Needle Bearing advantages in terms of *your* product . . . aircraft or automotive equipment . . . machine or portable tools . . . household or other equipment that you want to operate with maximum ease, combined with minimum size, weight—and cost? Our Catalog 32, showing the wide range of types, sizes and applications, will help you. Write for it today.



THE TORRINGTON COMPANY

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New York Boston Philadelphia Detroit Cleveland Seattle Chicago San Francisco Los Angeles Toronto London, England

TORRINGTON NEEDLE BEARINGS

The men who make TURNER *gauges*

Any gauge is only as good as the men who make it. The men who make Turner Gauges are expert craftsmen, men who are never satisfied with anything less than perfection.

TRADE PUBLICATIONS

Apprentice Program — An 18-page booklet describes the standardized methods used by the Canadian National Railways for training men in ten different trades. War Manpower Commission, Bureau of Training, Apprentice-Training Service, Washington, D. C.

Balls—Price List No. 11 is for the purchase of metal balls; it describes the standards to which they are produced, gives sizes, quantity prices, tolerances for various grades, hardness, and standard package data for chrome, brass and bronze, stainless steel and Monel balls. Strom Steel Ball Co., 1850 S. 45th Ave., Cicero 50, Ill.

Bearings—"Oilite Book of Powder Metal Products," a 23-page engineering section lists 13,000 available die sizes: also a 168-page catalog of powder metal bearing parts, giving load charts and pertinent engineering data. Chrysler Corp., Amplex Division, 6501 Harper Ave., Detroit 31, Mich.

Belting—Catalog section 2186-2-45 open end V-belts in long lengths, used with fasteners where an endless belt cannot be used, gives rules for application, method to determine pitch length, allowances for fastener length and for tension. B. F. Goodrich Co., 448 So. Main St., Akron, Ohio.

Belts—An illustrated bulletin describes a method of applying all types of wire belt hooks to flat belting. The Bristol Co., Waterbury 91, Conn.

Bronzes—Bulletin 59 describes a series of non-ferrous metals of controlled analysis, includes photomicrographs, physical properties and chemical compositions of bronzes containing aluminum, nickel, manganese, tin, lead and beryllium. Ampco Metal, Inc., 38th and Burnham Sts., Milwaukee, Wis.

Buffing and Polishing—Leaflet illustrates felt wheels and bobs. Divine Brothers Co., Utica 1, N. Y.

Centers — Price List FE-122 of Firthite-tipped centers, shows complete range of standard sizes carried in three styles of taper—Morse, Jarno, and Brown & Sharpe. The tips are Firthite sintered-carbide, grade

More answers to questions

ABOUT PLUNGE GRINDING AND CRUSH DRESSING

CAN ANY PLANT ADOPT CRUSH DRESSING?

Positively yes, regardless of whether the plant is small or large.

WHAT ABOUT SMALL PLANTS?

Production requirements may justify the purchase of Sheffield Precision Thread and Form Grinders, Micro-Form Grinders and other equipment offered by Sheffield. Or it is possible that production needs can be met with crusher rolls and mountings available from the Sheffield Corporation, Dayton 1, Ohio, for use on both surface and cylindrical grinders.

WHAT ABOUT LARGER PLANTS?

Many larger plants can use the entire line of Sheffield crush dressing equipment—Precision Thread and Form Grinder, Micro-Form Grinder and complete surface grinder equipment.

WHAT ABOUT CRUSHER ROLLS?

They can be obtained from The Sheffield Corporation. Crusher rolls for standard pitch threads are carried in stock—rolls for other pitches and all types of forms are available to specifications.

Crusher rolls for forms are made on the Sheffield Micro-Form Grinder and reproduced in quantity on the Sheffield Precision Thread and Form Grinder. Crusher rolls for threads are made originally and in quantity on the Precision Thread and Form Grinder.

WHO WILL HELP US APPLY THE PROCESS IN OUR PLANT?

Full knowledge of how crush dressing and plunge grinding are used abroad, plus a number of years' experience producing the equipment and applying the process in this country, are available to you from the staff of The Sheffield Corporation.

WHERE CAN WE SEE CRUSH DRESSING AND PLUNGE GRINDING IN ACTUAL OPERATION?

Sheffield not only builds Micro-Form Grinders and Precision Thread and Form Grinders, but also uses them in actual production of gages, instruments, machine tools, and in other close tolerance manufacturing work.

Visitors are always welcome at the Sheffield plants, Dayton, Ohio. If you can't come in person, write for Engineering Data.

The Sheffield Corporation

Dayton 1, Ohio, U. S. A.

How Ryerson Assures Alloy Steel Quality

Each alloy shipment is personally inspected and tagged as a part of a rigid quality control system, which we call the Ryerson Certified Steel Plan. This plan covers: selection of the individual heats of alloy steel, the testing of samples from each heat, the positive identification of every alloy bar with stamped heat symbol and painted color marking (or with a metal tag), and a Ryerson Alloy Steel Report, which is sent with each shipment. This report shows complete test information for the particular heat of steel used in filling your order. It contains: chemical analysis, recommended working temperatures, the Jominy hardenability results, and an interpretation of physical properties for 1, 2, 3 and 4 inch rounds quenched and drawn at 1000°, 1100° and 1200° F. The report serves as positive identification, a check on quality and as a guide to satisfactory heat treatment.

The Ryerson Inspection Tag symbolizes the final culmination of our quality controls, because it places a personal responsibility on us for the fulfillment of every specification in your order. This is the Ryerson way of making sure that you get the right steel. Ryerson alloys all receive the same systematic care. Call Ryerson for alloy steels, or for any other type of steel, and be assured of uniform quality and prompt action.

RYERSON CERTIFIED STEELS

Joseph T. Ryerson & Son, Inc. Plants: Chicago, Milwaukee, Detroit, St. Louis, Cincinnati, Cleveland, Pittsburgh, Philadelphia, Buffalo, New York, Boston

RYERSON STEEL-SERVICE

T-41. Firth-Sterling Steel Co., McKeesport, Pa.

Cerium — Bibliography of selected literature and patent reference regarding the uses of the metal cerium in conjunction with magnesium and aluminum: the information has been selected from English, French and German material of the past 20 years; important articles are summarized, sources are indicated, and patents listed. Cerium Metals Corp., 522 5th Ave., New York 18, N. Y.

Corrosion—Bulletin No. R-181 describes an electrical method of preventing the rusting of steel tanks, piping and other steel structures. Illustrates examples of its use, describes the equipment and includes a table of comparative costs. The Johnson & Jennings Co., 864 Addison Road, Cleveland 14, Ohio.

Dies—Leaflet describes uses of templet dies for short runs and preruns before regular dies are finished. Algoma Products, 3080 E. Outer Drive, Detroit 12, Mich.

Gas Analyzer—Pub. 45-743 describes a special analyzer for high purity oxygen, carbon dioxide, and nitrogen in the range of 90 to 100 percent. Series "E," for testing high purity oxygen for use in flying, is similar to the standard Orsat but its operation differs somewhat. Available in two styles, wall mounted or portable. Hays Corporation, 1942 Shirl Ave., Michigan City, Ind.

Gears—MR-45 a 52-page catalog describing an entire line of self-contained motorized speed reducers, both horizontal and vertical types; complete engineering data are given. Philadelphia Gear Works, Venango & G Sts., Philadelphia, Pa.

Gears—"The Art of Generating with a Reciprocating Tool," a basic treatise on the art of producing parts by the movement of a point on the cutting tool; profusely illustrated with many examples. Also a four-page leaflet describes methods for cutting internal and external splines. The Fellows Gear Shaper Co., Springfield, Vt.

Grinding—101 questions answered about almost every grinding problem: a complete index is in front of the book. Simonds Worden White Co., 1101 Negley Place, Dayton 7, Ohio.

Heaters—12-page booklet describes the influence of corrosion on the

BAR-STOCK TO FINISHED PART

18-8 STAINLESS... 30% BETTER TOOL LIFE

SUNICUT...

Keeps Small Tools Working Longer, Produces Better Finish

An eastern manufacturer was turning out 18-8 stainless-steel eye-terminals for the Navy on a Simmons Micro-Speed No. 2 Turret Lathe . . . cut-off and shape, rough turn, form, spot drill, drill, ream, and circular-form turn.

The material was 1" round annealed bar-stock, cut at a speed of 130 s.f.p.m. and spindle speed of 500 r.p.m. All tools were high-speed steel, except the rough turn and form tools which were carbide-tipped.

Short tool life . . . and poor finish, which necessitated hand-filing, were a problem, until a Sun Cutting Oil Engineer was called in, studied the different operations, and recommended Sunicut. With this transparent, sulphurized cutting lubricant, tool life has increased 25% to 30%; finish is now excellent; the hand-filing has been eliminated. Reamers now last 600 hours; forming tools average 280 hours.

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efficient operation of unit heaters; contains technical information and illustrations of cast iron fin-type unit heaters. D. J. Murray Mfg. Co., 104 Murray Blvd., Wausau, Wis.

Heating—Bulletin B-6373 describes mercury arc converters designed for induction heating operations in the 500 to 2,000 cycle frequency range. Examples are given for heating and melting metals. Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

Instruments—Bulletin 45-713 illustrates various types of instruments and control for pressure reducing, pressure relief or back pressure, rate of flow, speed, liquid level and density. Various instruments and controllers are illustrated, and schematic drawings of typical applications are given. The Hays Corporation, 1942 Shirl Ave., Michigan City, Ind.

Magnets—GEA 3682-B a 20-page book about sintered Alnico magnets describing the manufacture, application, and properties of this type of magnet. There are 12 pages of dimensioned diagrams and prices of many shapes of magnets. General Electric Co., Schenectady, N. Y.

Material Handling—Bulletin 139 illustrates and describes many types of hydraulically operated lifting, transporting and testing apparatus. Eleven types of apparatus are shown with their capacities and leading dimensions. Lyon-Raymond Corp., 109 Madison St., Greene, N. Y.

Material—Catalog describes an extensive line of friction materials made in a number of types and structural modifications to meet industrial equipment needs. The Manhattan Rubber Mfg. Div., 92 Townsend St., Passaic, N. J.

Motors—GEA-4131 illustrates and describes many types of d.c. and a.c. explosion proof motors and control, giving history of the development, Underwriters' and Bureau of Mines requirements, and maintenance and repair suggestions. General Electric Company, Schenectady, N. Y.

Plating—Bulletin describes the advantages of the "Udylite Bright Nickel Process," giving information about the process and equipment. The Udylite Corporation, Detroit 11, Mich.

Power—Form 245 is a booklet describing many types and capacities of single and three-phase, 110/220

volts, gas engine driven a.c. power plants, generators of many kinds, rotary converters and motor-generator sets. Kato Engineering Co., Mankato, Minn.

Rivnut—Data book about Rivnut originally used for attaching rubber deicers to airplanes. Shows types, methods for application to metal, plastics and wood, also replacement parts. Test data for eccentric, single and double shear, tension and torque loads are also included. Dimensions for many sizes and head types are listed. B. F. Goodrich Co., Akron, O.

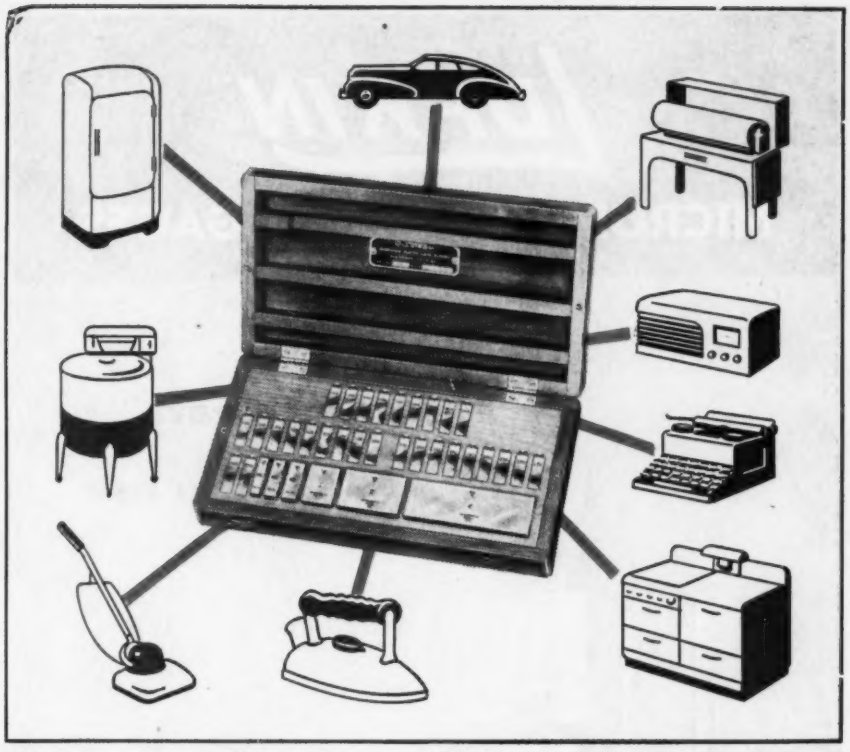
Rubber — Manual on "Fairprene" synthetic rubber sheet stocks supplies graphs, charts, testing procedures and results to determine resistance of material to various types of oils, solvents, acids and alkalis, to natural and accelerated aging, temperature, fresh and salt water, set and drift as well as flame. Fabrics and Finishes Dept., E. I. duPont de Nemours & Co., Wilmington, Del.

Separators—Bulletin 151-C describes and illustrates applications of motor-driven magnetic automatic coolant separators whose purpose is to eliminate metal swarf and abrasive particles from the coolant used in honing machines, cylindrical, internal, surface, crankshaft and other wet grinders, including thread grinders. The magnetic drum attracts and removes from the coolant solution the magnetic swarf and most of the entrained abrasive particles, permitting repeated use of the cleaned coolant. There is an outline drawing and a tabulation of information about three sizes of machines. Barnes Drill Co., 814-830 Chestnut St., Rockford, Ill.

Spray Guns—Catalog No. 15 describes a complete line of Air Saver Blow Guns, Spray Guns and Water Savers with full specifications and tips on where and how to use them. Lonn Mfg. Co., P. O. Box 394, Indianapolis, Ind.

Steel—Bulletin No. 1144-NM describes the applications of non-magnetic manganese steel, where high resistance to impact and abrasive wear are required. American Brake Shoe & Foundry Co., American Manganese Steel Division, 388 E. 14 St., Chicago Heights, Ill.

Steel—DS115, about Ketos oil hardening tool steel, gives data about the forging temperatures and heat-treatment of this steel. Charts give the size change at different quench-



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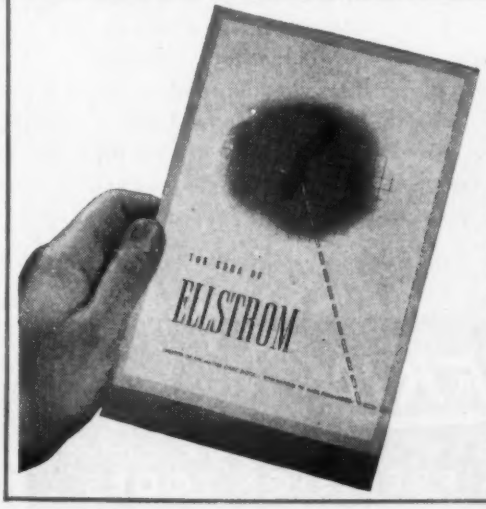

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ing and tempering temperatures, toughness curves and transformation characteristics for different temperatures and time. Crucible Steel Co. of America, 405 Lexington Ave., New York 17, N. Y.

Tachometers — GEA-4324 describes and illustrates electric tachometers. Dimensioned line drawings of instruments required are given. General Electric Co., Schenectady, N. Y.

Threads—Handy tap selector, vest pocket size, gives the information about the correct tap to use, the proper lubricant and the right tapping speed. Threadwell Tap & Die Co., 116 Arch St., Greenfield, Mass.

Vibration Control—Catalog H-600 illustrates and describes a spring suspension which, in conjunction with an inertia mass of concrete, or just plain spring isolators, absorbs the impact forces due to drop hammers or heavy presses. The Korfund Co., Inc., 48-15 32 Place, Long Island City, N. Y.

Welding—"Flash Welding," a four-page folder illustrating various assemblies made by this method. American Welding & Mfg. Co., 1800 Griswold St., Warren, Ohio.

Welding Rods—Form F-428 calls attention to Fanweld-O hard facing rod and its uses in facing punches and dies and putting into service various types of machinery through its use in salvage and repair work. Fansteel Metallurgical Corporation, N. Chicago, Ill.

Wire—A circular illustrating "Knitted Wire" in the form of tubing in various diameters and lengths and several kinds of material. E. H. Titchener & Co., Walnut St., Binghamton, N. Y.

NEW BOOKS

PRINCIPLES OF FIREARMS—By *Charles E. Balleisen, Major, Ordnance Department, Army of the United States. 140 pages. Published by John Wiley and Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $2.50.*

Engineering fundamentals for the analysis, design and construction of modern firearms are presented in this book. The views are those of the author and in no way represent official opinions of the Army.

Major Balleisen considers auto-

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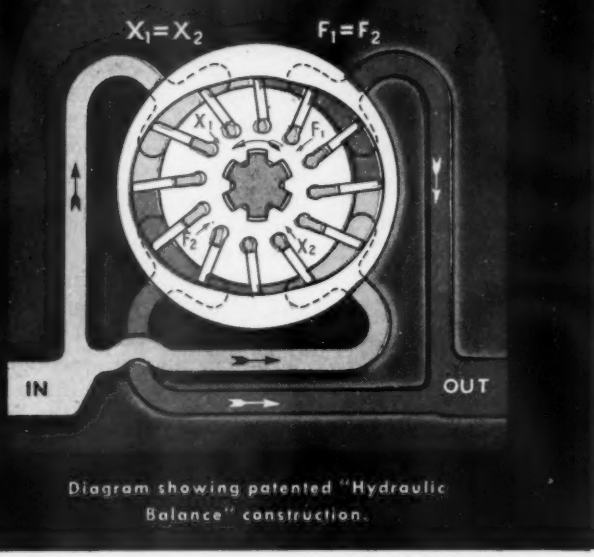

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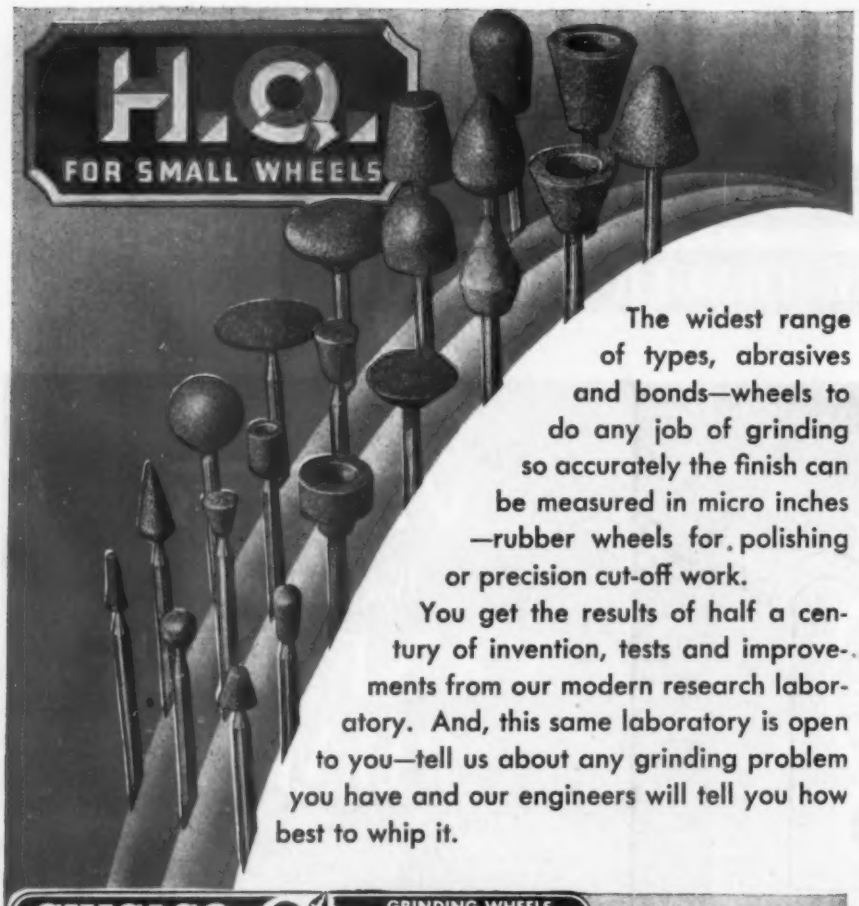

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matic firearms as pieces of machinery operating in accordance with laws of physics. Production aspects of firearms are reviewed in detail. Data on various types of guns are explained with particular emphasis on their automatic operation. The importance of corrosion resistance and lubrication are stressed. Many design problems are presented and analyzed. One chapter is devoted to the testing of firearms.

•

FABRICATING METHODS FOR LUMARITH, CELLULOID AND SIMILAR THERMOPLASTIC MATERIALS — *Published by the Celanese Plastics Corp., 180 Madison Avenue, New York 16, N. Y. 125 pages. $1.*

Compiled in an effort to serve the growing needs of the plastics industry, this book should serve as a valuable addition to the libraries of those dealing with plastic materials. The book opens with the subject of primary cutting. Recommended processes for reducing sheets, rods and tubes to the proper size before fabrication are explained.

The chapter on secondary cutting embraces routing, milling, drilling, reaming, tapping, lathe operations and screw machine operations. Different finishing methods are described, including tumbling, sanding, ashing, cleaning, dipping, polishing, embossing and cementing. One chapter is devoted to molding processes — compression, injection, transfer, jet and dry extrusion. Electrostatic heating of the materials is described.

The final text chapter is a descriptive booklet in itself, presenting tables of properties, types and forms available, and applications. The book's subject matter is thoroughly illustrated with line drawings and photo reproductions.

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A SOUND FILM describing the abrasive cut-off method has been made available by A. P. de Sanno and Son, Inc., manufacturer of radiac abrasive cut-off machines and disks. It shows the effectiveness of cutting-off action and cutting-off time for many metals including roller bearing stock of 1 5/16 in., and unannealed stainless steel one inch square. The film is available to engineering societies, training schools and manufacturers engaged in cutting-off operations.

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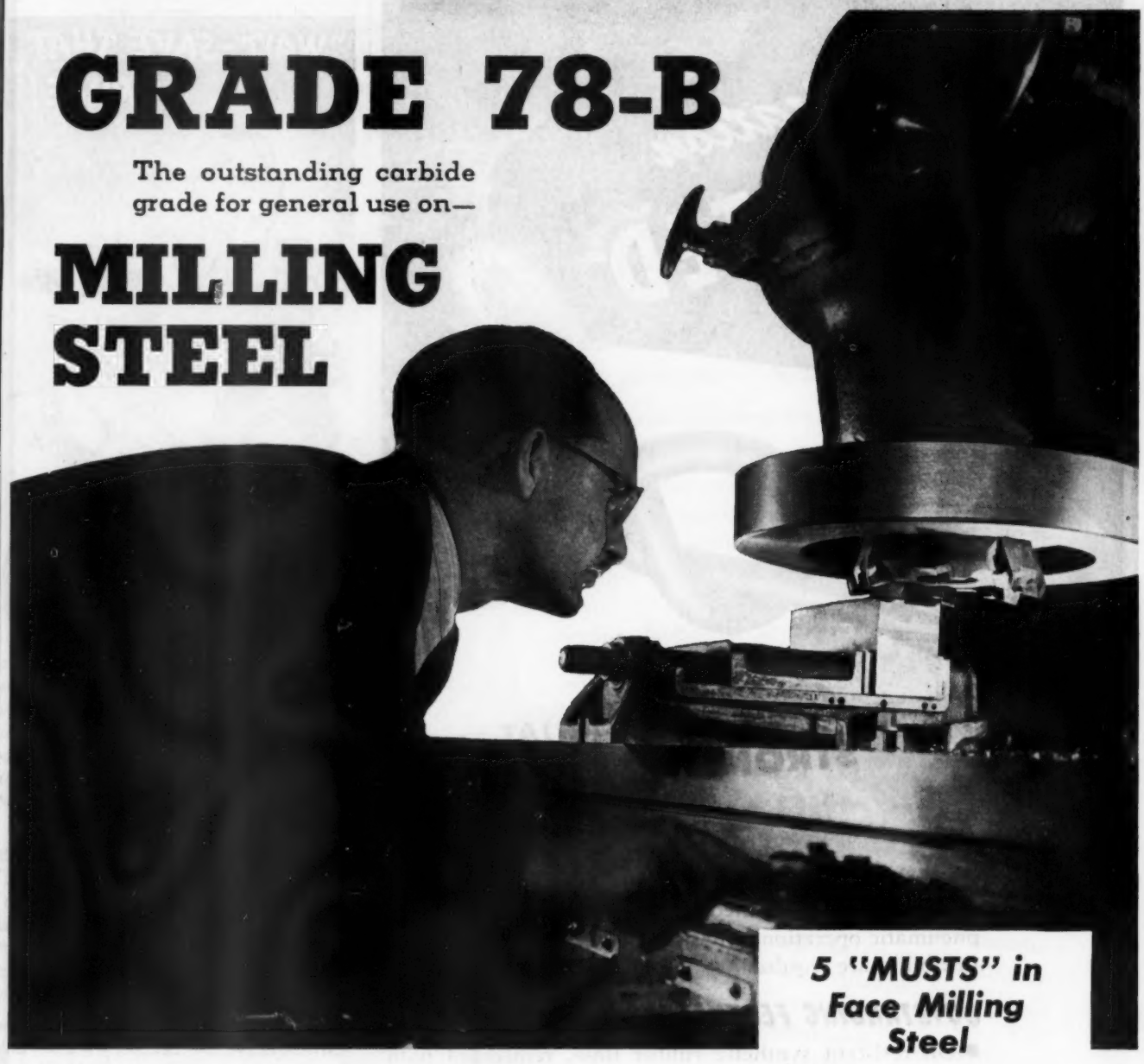

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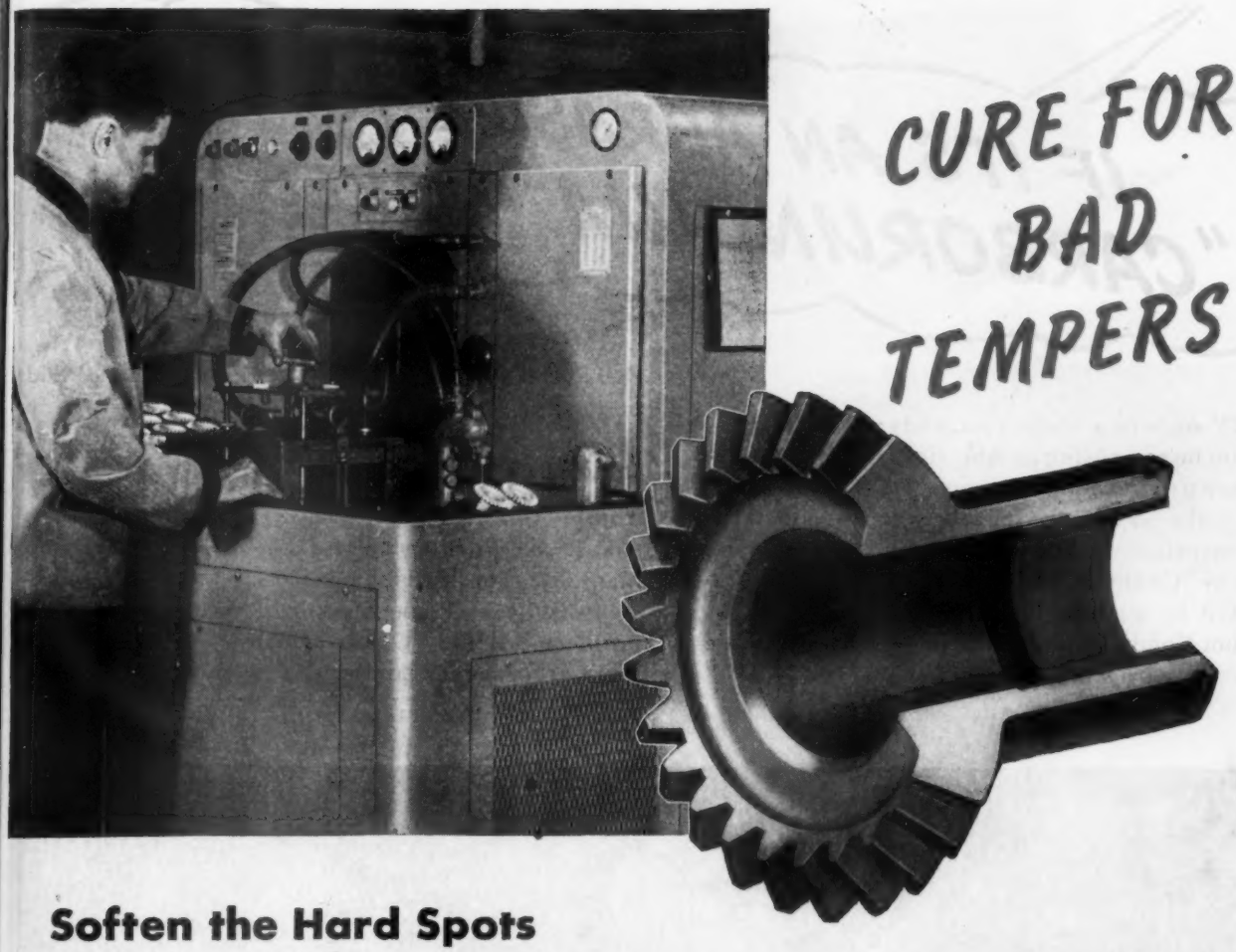

CURE FOR BAD TEMPERS

Soften the Hard Spots

... Eliminate Tool Breakage with the TOCCOTRON

NASH-KELVINATOR, Aircraft Engine Division offers this suggestion to shop executives who are vexed with the tool-breakage bogey.

Anneal the portion of the part to be machined. Do this without disturbing previous hardening where desired by localizing the annealing with TOCCO Induction Heating. Results for a number of their aircraft engine parts: breakage of expensive broaching tools and resultant delays are now nil. The gear illustrated, for example:

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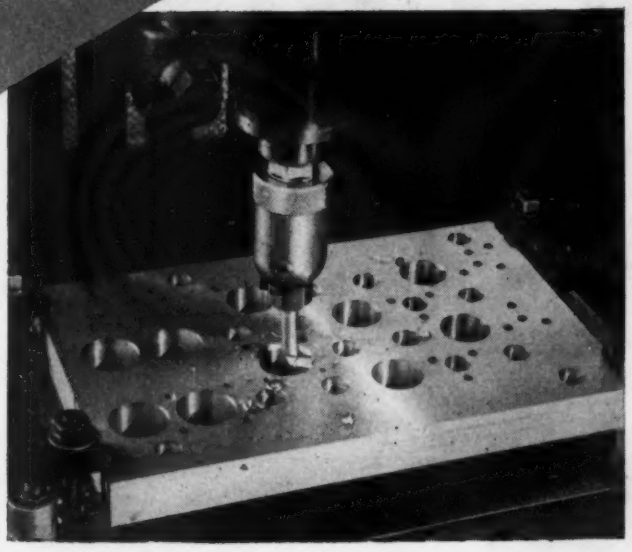
HOW TO OBTAIN *increased speed* AND *closer tolerances* IN JIG BORING



NO S-T-O-P and S-T-A-R-T TO CHANGE TOOLS AT EACH HOLE

In the Moore Jig Borer you can *consecutively* spot, drill, bore and ream *all* holes in the work-piece with minimum tool changes. In other words, you don't have to change tools at individual holes for each operation, because there are no size blocks or end measures to labor over.

Accurate lead screws *built into* the Moore Jig Borer enable you to make table settings faster than you can change tools. A glance at your blueprint—a few turns of the micrometer dials and the work is set to precise location. Moore lead screws, accurate to .0002″ over 14″ of travel and .00005″ in any given inch see to that. Another advantage—you make each setting three times, enabling you to quickly notice and correct any errors you may have made.

The Moore Jig Borer is ideally suited for jigs, fixtures, dies, special machine parts and jig-less, small-lot production. It is highly sensitive for holes 1/32″ diameter, yet rugged for heavy cuts up to 4½″.

RAPID TABLE SETTINGS PROMOTE GREATER ACCURACY IN FINISH BORING

Rapid table settings on the Moore Jig Borer encourage operators to follow the best toolroom practice—roughing *all* holes before finish-boring *any* of them.

Moore lead screws are so fast to set—faster than tool changes—that it *pays* to pre-rough all holes. Temperature changes or stresses caused by roughing cuts *cannot* interfere with finish-boring.

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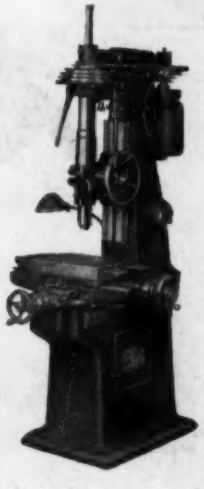
All finish-boring is completed without stressing or heating of the work-piece. These favorable conditions, maintained throughout the entire finish-boring operation, on the Moore Jig Borer, are further assurance of ultimate accuracy in the completed work.



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# of MACHINABILITY

Look at the little camshaft on the opposite page. It was made from UNION SUPERCUT (A.I.S.I. B-1113)—fabricated on automatic and hand screw machines, then hardened at wearing surfaces by selective carburizing.

But the important part of the story is the amount of machining necessary. The weight of the finished camshaft—only ⅛ of the steel bar from which it was made—indicates that it was necessary to machine away ⅞ of the original bar to produce this complicated little part.

That's why UNION SUPERCUT was used—because it is "tops" among free-machining steels.

Long ago, Union Drawn recognized the vital importance of *MACHINABILITY* in the production of steel parts. Metallurgists directed the major share of their laboratory and plant research toward better machinability. Engineers cut up tons of steel on an "automatic" and spent days and weeks in customers' plants studying the performance of various steels.

The results: A steadily increasing ability on the part of Republic Union Cold Drawn Steels to machine to a fine, smooth surface at higher speeds and heavier feeds.

A marked decrease in abrasive elements in the steel—providing longer tool life, more parts per dollar of tool investment, fewer grindings of tools, greater efficiency of operation, more output.

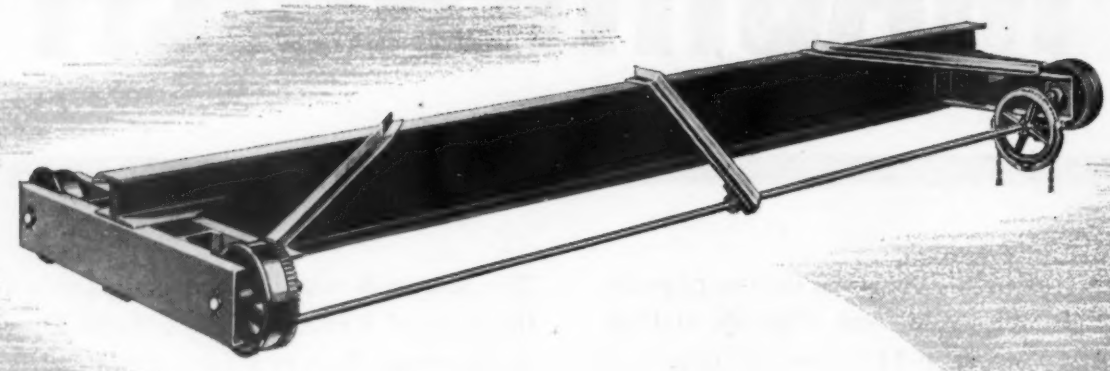
And all these advantages without sacrifice of physical and heat-treating properties.

This little camshaft is only one of thousands of different parts which have demonstrated the cost-saving, production-increasing machinability of Republic Union Cold Drawn Steels. The steel parts YOU make probably will do the same if you specify these steels. Republic metallurgists are ready to work with you to obtain maximum results in machining and heat treating.

REPUBLIC STEEL CORPORATION
Union Drawn Steel Division • Massillon, Ohio
GENERAL OFFICES • • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N. Y.

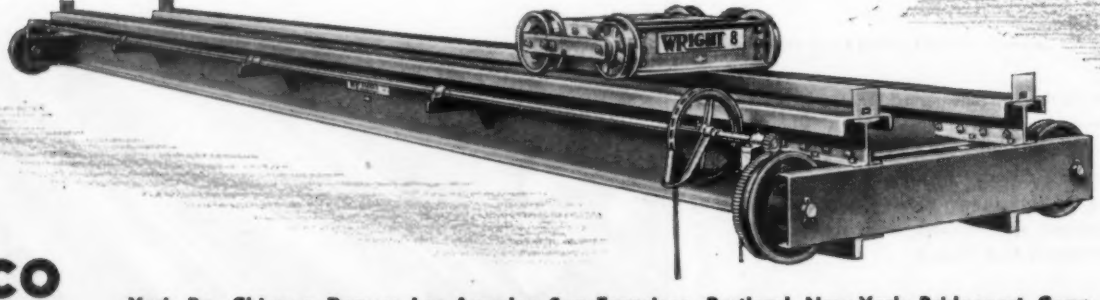
To further increase machinability, and to assure uniform hardness and physical properties, Union Drawn has greatly increased capacity in all plants for *furnace treated* cold drawn steels—annealed, normalized, spheroidized, stress relieved and otherwise heat treated.

WRIGHT CRANES



THINK what an overhead traveling crane, with a WRIGHT HOIST and TROLLEY, could do—when it comes to moving machinery around, or in and out, in that reconversion job that is just ahead. A WRIGHT TRAVELING CRANE would really put your ceiling to work, and speed up not only reconversion but subsequent civilian goods production as well. The WRIGHT combination of crane and hoist would help bring your production costs down to competitive levels.

WRIGHT material handling equipment (cranes, hoists and trolleys) is built in any desired capacity and to meet the most exacting specification. If your problem is special, ask local WRIGHT distributor (see metropolitan classified telephone directory) to call in a WRIGHT engineer. In the meantime, write for WRIGHT Specification Bulletin, or Catalog 12-D.



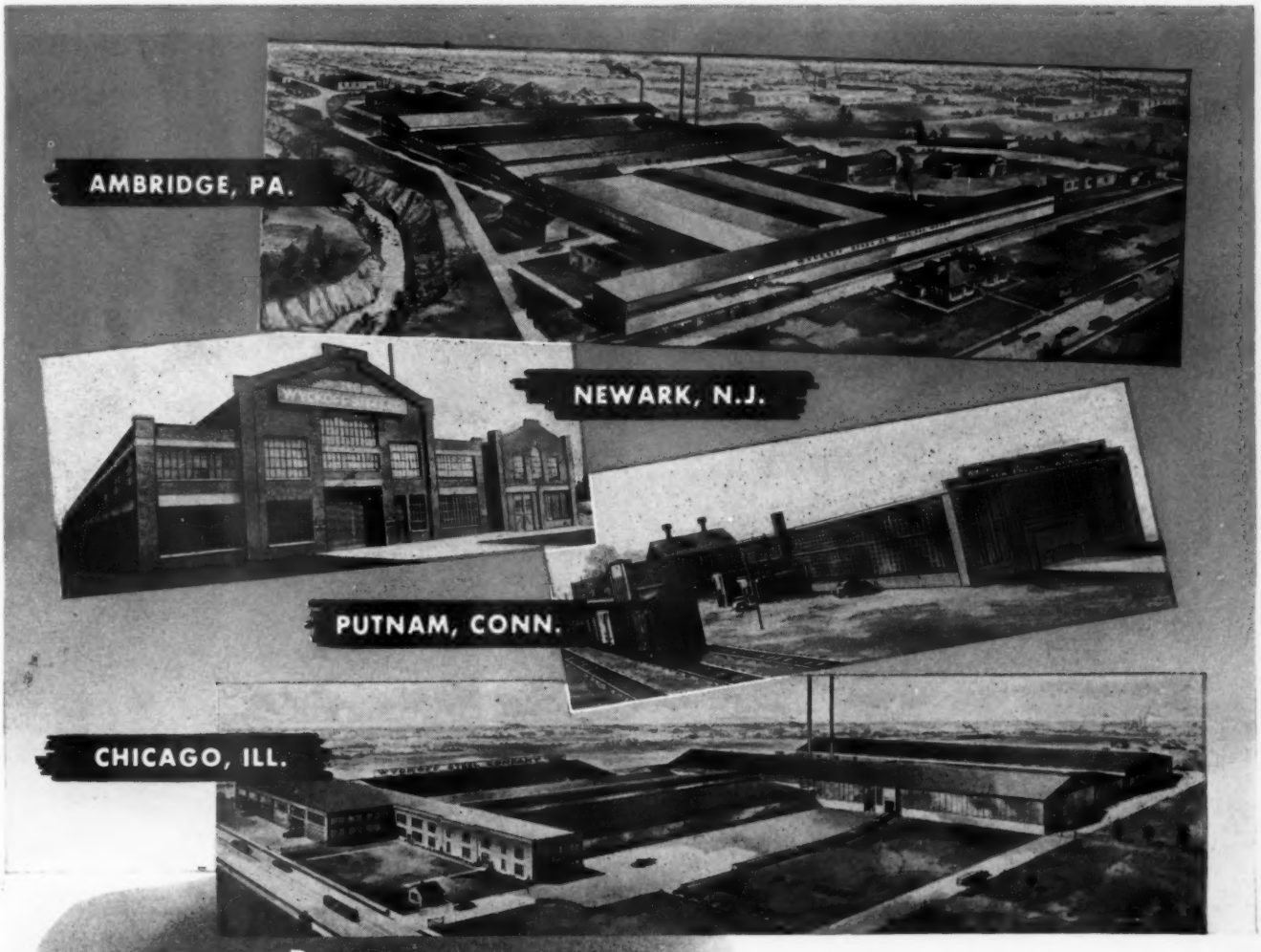
ACCO

York, Pa., Chicago, Denver, Los Angeles, San Francisco, Portland, New York, Bridgeport, Conn.

WRIGHT MANUFACTURING DIVISION
AMERICAN CHAIN & CABLE

TRADE MARK

In Business for Your Safety



Wyckoff

COLD FINISHED STEEL PRODUCTS

★ Carbon and Alloy
Rounds ⅛" to 8"
Squares ⅛" to 4"
Hexagons ⅛" to 3⅞"
Flats ⅛" x ¼" to 2" x 12"

★ Turned and Polished Shafting

★ Turned and Ground Shafting

★ Special Sections

With unexcelled furnace facilities for producing a complete range of sizes and treatments.

FROM 1 to 4

***. . . because of constant adherence to the highest standards of* QUALITY, ACCURACY *and* SERVICE TO INDUSTRY**

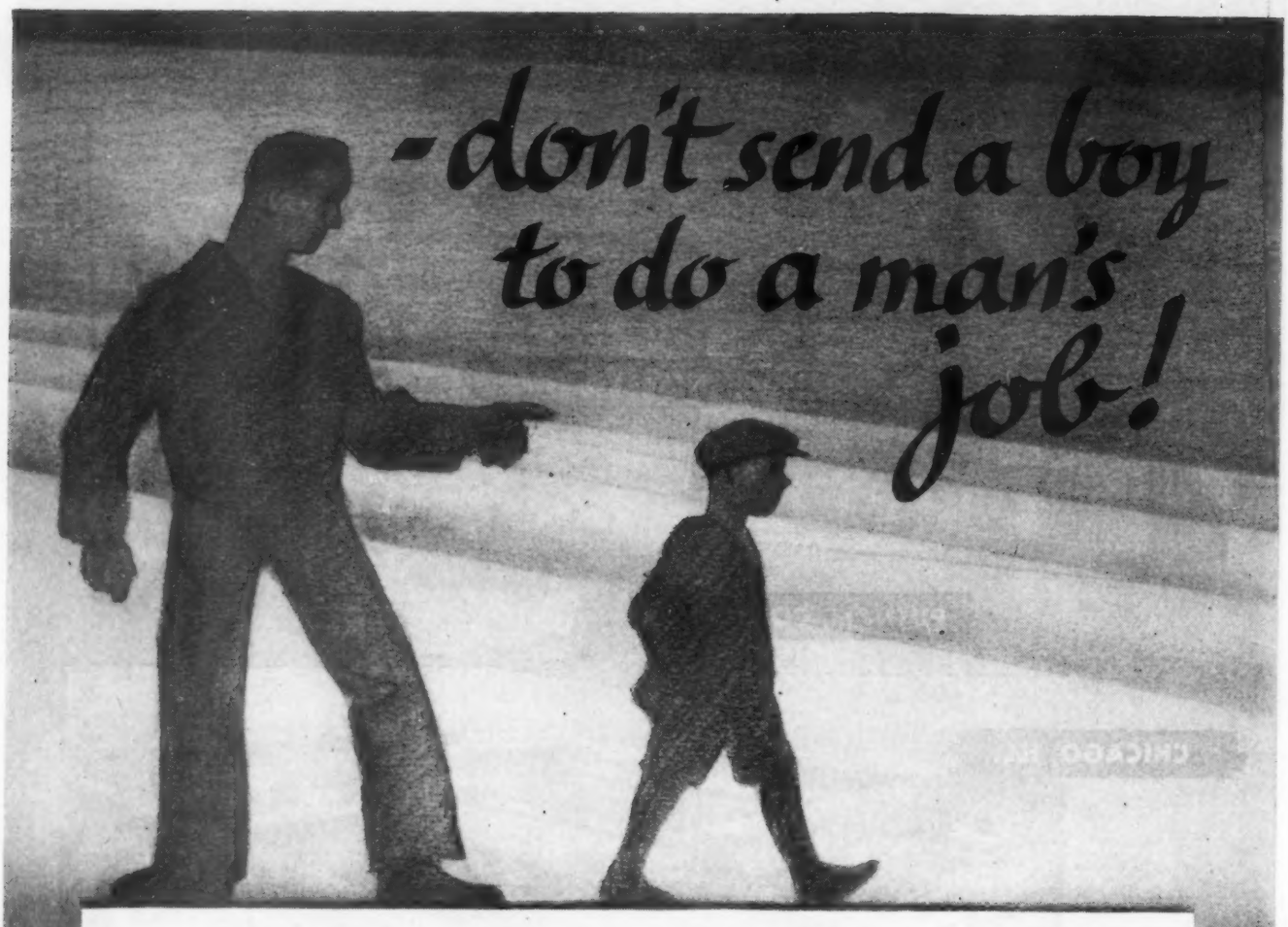
. . . and when the guns of war are silenced, a network of representatives from coast to coast, with complete warehouse stocks in every large industrial center, will be ready to serve your *every* need for cold finished steel products. In the meantime, let Wyckoff engineers work with you, in planning for those *cost-saving* days to come.

ARMY E NAVY

WYCKOFF STEEL COMPANY

FIRST NATIONAL BANK BUILDING · PITTSBURGH 30, PA.
3200 S. KEDZIE AVENUE, · CHICAGO 23, ILLINOIS

Works at
AMBRIDGE, PA.
CHICAGO, ILL.
NEWARK, N.J.
PUTNAM, CONN.



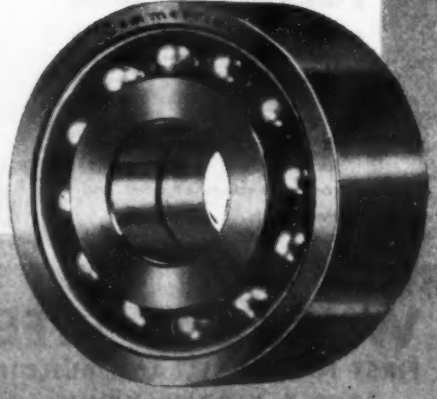
The ball bearing principle has survived the centuries. Ball bearings reduce friction and wear. They are dependable, reliable, durable. If you are now planning future production, don't send a boy to do a man's job, — use sturdy, strong ball bearings — Schatz "Commercial" Ball Bearings.

SCHATZ

"Commercial"

BALL BEARINGS

Schatz "Commercial" Ball Bearings are available for every purpose, — *good*, low friction bearings, moderately priced. Use "Commercials" in your plant, or product.



THE SCHATZ MANUFACTURING COMPANY
POUGHKEEPSIE, N. Y.

REPRESENTATIVES LOCATED AT
Detroit: 2640 Book Tower—26 • Cleveland: 402 Swetland Building—15
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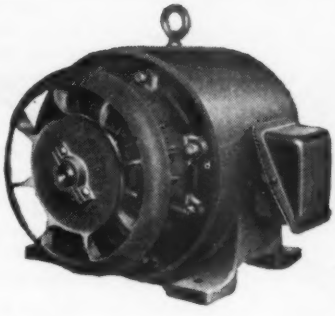
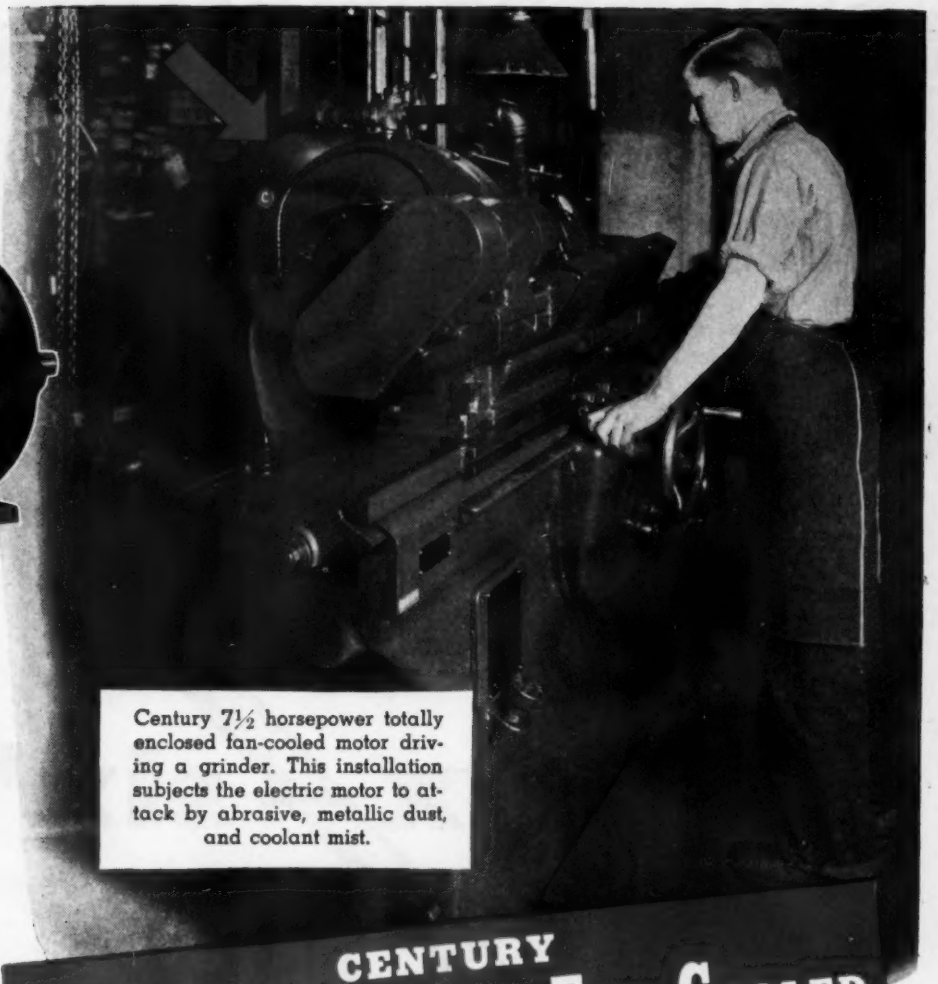
CENTURY MOTORS
—A Vital Factor in Building a Better Product at a Lower Cost.



Century Totally Enclosed Fan Cooled Motor with the steel fan cover removed.

Century Totally Enclosed Fan Cooled Motor End Bracket

Century Totally Enclosed Fan Cooled Motor Frame and field winding showing the air passages.



Century 7½ horsepower totally enclosed fan-cooled motor driving a grinder. This installation subjects the electric motor to attack by abrasive, metallic dust, and coolant mist.

CENTURY TOTALLY ENCLOSED FAN COOLED MOTORS Mean Motor Protection in Destructive Atmospheres

This is true because the vital parts of the motor are isolated from cutting solution fogs, abrasive and metal dust, oil-laden factory dust, chips, etc.

A large fan blows a blast of cooling air around the frame that seals in the windings and bearings.

If you require that motors operate in an atmosphere containing destructive dusts, abrasives, mists, fogs, etc., be sure to call in a Century engineer to get all the facts about what Century Totally Enclosed Fan Cooled Motors can do for you.

Century motors are available from 1/20 to 600 horsepower.

Century C MOTORS

CENTURY ELECTRIC COMPANY
1806 Pine Street, St. Louis 3, Missouri
Offices and Stock Points in Principal Cities

429

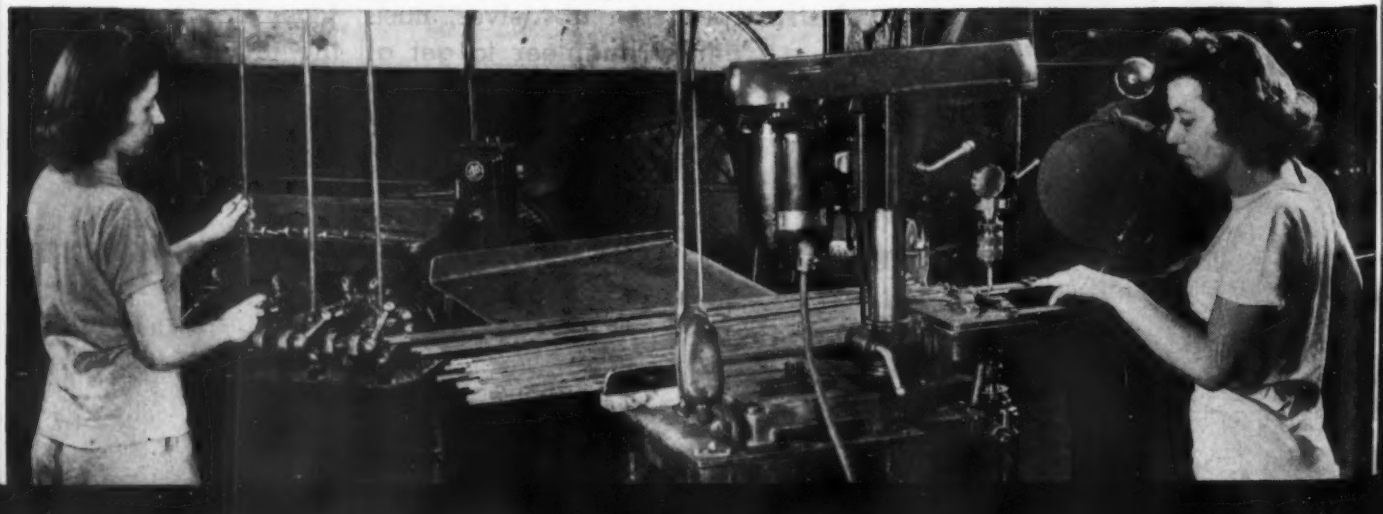
"mr. five by five" or "six—six"

Because of the versatility of our modern equipment, Buffalo Bolt is in a position to supply you with any size or shape circle Ⓑ fastener—standard or special—for your present war effort or post-war planning.

BUFFALO BOLT COMPANY

NORTH TONAWANDA, NEW YORK
SALES OFFICES IN PRINCIPAL CITIES

Drilling the rods for cartridge cases. Millions have been turned out by Buffalo Bolt Company since Pearl Harbor.



DO YOU MAKE ANY PARTS LIKE THESE?

They are all made from Shelby Seamless Tubing

1. Contact Coupler for searchlight truck
2. Top roller for half-track
3. Bogie wheel hub
4. Impeller
5. Winder cam for textile machine
6. Finished connecting rod bearing
7. Main crank shaft bearing shell
8. Finished crank shaft bearing
9. Spinning ring for rayon machine
10. Finished propeller shaft bearing
11. Steel shell for propeller shaft bearing
12. Finished steel-bronze bearing
13. 14. Clutch-bearing shells
14. Roller for conveyor
15. Spacer for bearings
16. Bearing shell
17. Airplane engine suspension cylinder
18. 20. Finished bearings
19. 22, 23. Cartridge receivers for small arms
20. Airplane engine suspension, steel-rubber-steel
21. Finished clutch bearing

Seamless Steel Tubing will help...

THESE parts have one characteristic in common—they have all been designed to utilize the basic advantages of seamless steel tubing. Many of them were previously made by forging or by machining from solid stock.

Such methods were comparatively slow and wasted a considerable amount of valuable metal. Often the percentage of rejects was alarmingly high.

By skillful redesign, starting with an accurately made seamless tube, production in many cases has been doubled and even tripled. Man and machine time have been cut to the core. Finished parts are more uniform, and, in some cases, rejects have been reduced to zero.

It is easy to see how these faster, better methods will trim off unnecessary costs. Savings as high as 50% are not uncommon.

When you are redesigning your products, let us show you what you can do with SHELBY Seamless Mechanical Tubing to save money, save materials and get a better product. Blueprints or sketches of your design will be carefully examined and suggestions cheerfully made without obligation.

1 *Speed up production*

2 *Make a better product*

3 *Save money, time and steel*

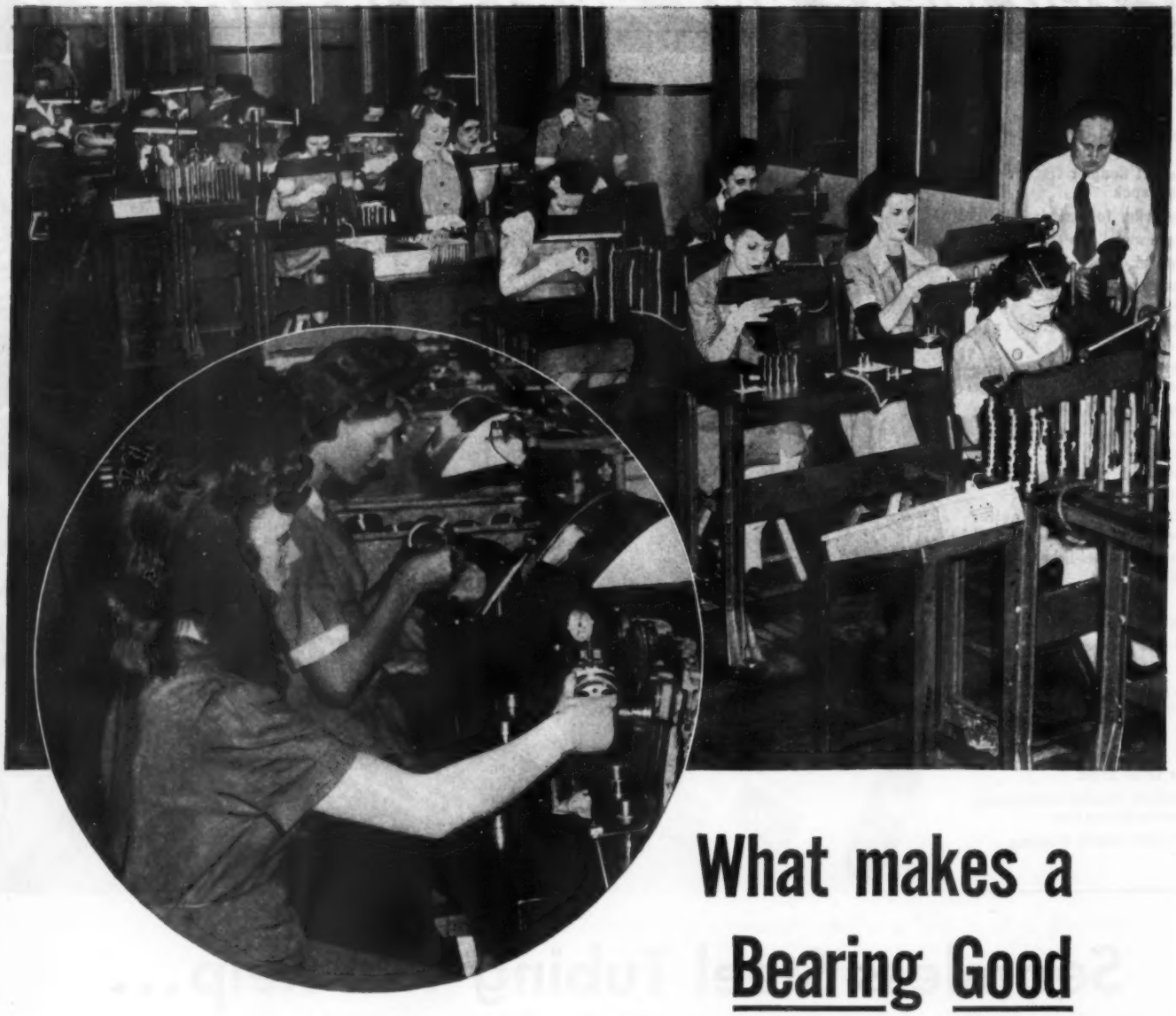
NATIONAL TUBE COMPANY

Pittsburgh, Pa.

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*

United States Steel Export Company, New York

UNITED STATES STEEL



What makes a Bearing Good

There are certain folks with Hyatt who won't believe anything they are told about a bearing. They have to *see for themselves!*

That's their job. It starts even before we get the steel from which the bearings are made. Hyatt metallurgists are right in the steel mills to see that specifications are met. It continues through the various steps of precision manufacture until the finished Hyatt Roller Bearing is finally assembled and shipped.

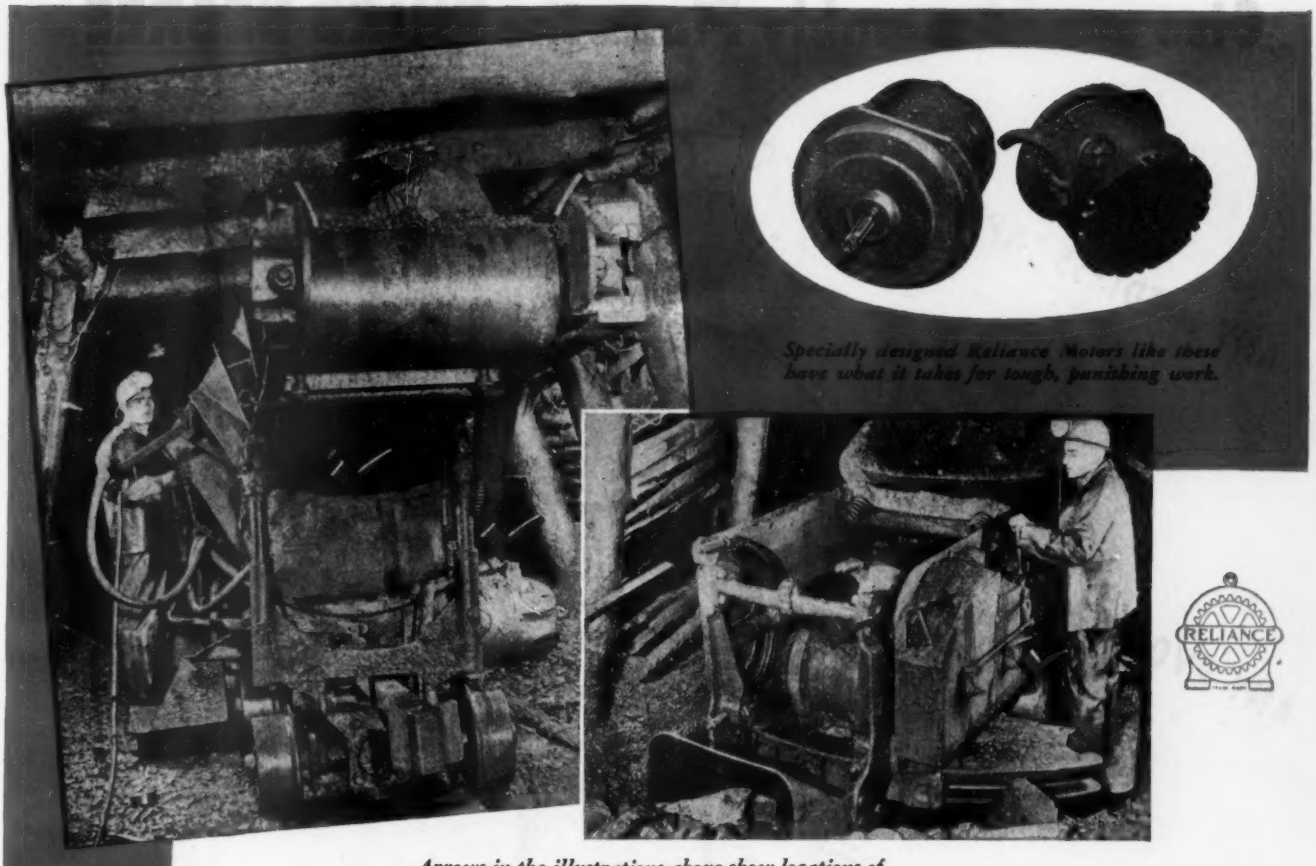
It isn't going to extremes to have so many men and women operators spending all of their time testing, inspecting, checking and rechecking Hyatt Roller Bearings. This sort of painstaking care is one of the things that makes a bearing good.

And it pays! For faultless bearings are essential to faultless operation—whether the application is for the machine that makes a bomber's crankshaft, or for the crankshaft after it's in the bomber.

Hyatt Roller Bearings have to "make good", so they have to be made good! That's why so many are used.

HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION

HARRISON, NEW JERSEY



Specially designed Reliance Motors like these have what it takes for tough, punishing work.

Arrows in the illustrations above show locations of Reliance Motors in a heavy-duty mining machine.

Here's Where RELIANCE MOTORS REALLY TAKE A BEATING!

Where motors are called on to do tough, dirty, bruising work, it is important that they be designed with electrical as well as mechanical characteristics specifically fitted to the job.

Nowhere, probably, do motors take a worse beating than in the Eimco Rocker-Shovel, yet in this punishing service specially designed Reliance Motors have proved that they can both outperform and outlast other motors formerly used. And in many other tough assignments in many industries, Reliance installations are standing up equally well.

When you have need of motors that can really take it—or, for that matter, whenever you need motors for any industrial use—it's a good rule to call in a Reliance Application Engineer. He can put a lot of specialized experience at your service.

RELIANCE ELECTRIC & ENGINEERING CO.

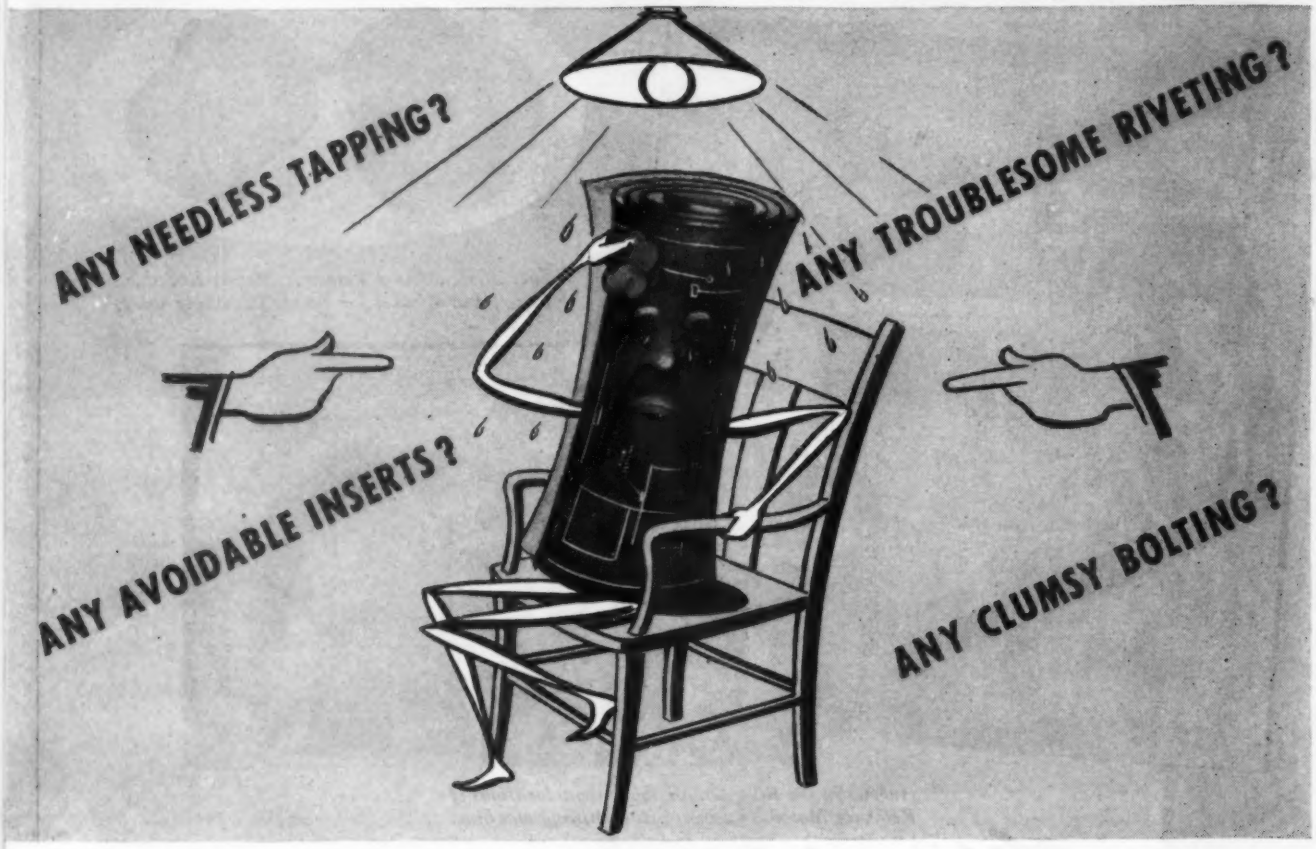
1075 Ivanhoe Road • Cleveland 10, Ohio

Birmingham • Boston • Buffalo • Chicago • Cincinnati • Detroit • Greenville (S. C.) • Houston • Kalamazoo • Los Angeles • Minneapolis New York • Philadelphia • Pittsburgh • Portland (Ore.) • St. Louis • San Francisco • Syracuse • Washington, D. C. • and other principal cities.

RELIANCE A-C D-C MOTORS

"MOTOR-DRIVE IS MORE THAN POWER"

Give your Assembly Plans the THIRD DEGREE



...*before* you set up for post-war products

SAVINGS UP TO 50% in assembly time and labor costs have been made by thousands of manufacturers when they switched to the short cut fastening method – Parker-Kalon Self-tapping Screws.

YOU CAN START SAVING when you start production if you question every fastening *now*, while your plans are still in process. Why wait to find fastening "bugs" later, when a change now requires only a little pencil work.

WHATEVER MATERIAL you are working with – plastics, die castings, sheet steel, aluminum, brass, fibre – in 7 out of 10 cases you'll find you can save with P-K Screws, and improve your product as well!

WILL YOU BE ALL TOOLED UP FOR TROUBLE?

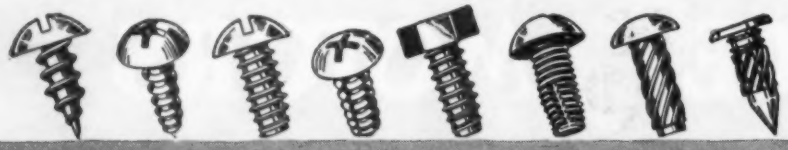
The Daven Company, Newark, N. J., makers of radio and electronic equipment, says, "We had loads of trouble tapping sheet brass . . . couldn't get good, clean threads, especially with unskilled help.

"Now, in these attenuators, we fasten the aluminum cover to a brass stamping, .065" thick, with P-K Type "Z" Self-tapping Screws, and our trouble is ended. Besides eliminating tapping and speeding the work, the P-K Screws form threads that are near to perfection, hold securely."

Find "bugs" like this beforehand in your product — save the needless cost of tooling up for trouble!

P-K SELF-TAPPING SCREWS save by eliminating the tapping and tap expense necessary for machine screws, and the slow fumbling with bolts and nuts. They also eliminate costly insert in plastics, and riveting in hard-to-reach places.

ASK A P-K ASSEMBLY ENGINEER to check over your plans with you to make sure you find all the fastening "bugs". Or, mail us assembly details for recommendations. Parker-Kalon Corp., 208 Varick St., New York 14, N. Y.



PARKER-KALON
Quality-Controlled
SELF-TAPPING SCREWS

FOR EVERY METAL AND PLASTIC ASSEMBLY

CHAMPION OF COLD-BATTERING TOOL STEELS

Here's the champion of its class: Bethlehem Omega.

Developed primarily for work at normal temperatures, Omega possesses the ultimate in shock-resisting properties. It is recommended for such tools as pneumatic chisels; punches; beading and calking tools; shear blades; forming tools and rolls; and all other tools requiring high shock-resistance with high hardness.

And listen to this:

- Omega can be quenched in either oil or water. Its normal working hardness is 58-62 Rockwell C.
- In its maximum heat-treated condition, its resistance to impact, using Charpy unnotched specimen, is approximately 130 foot-pounds.
- It maintains a good cutting edge and has high wear-resistance in all types of tools for which it is suitable.

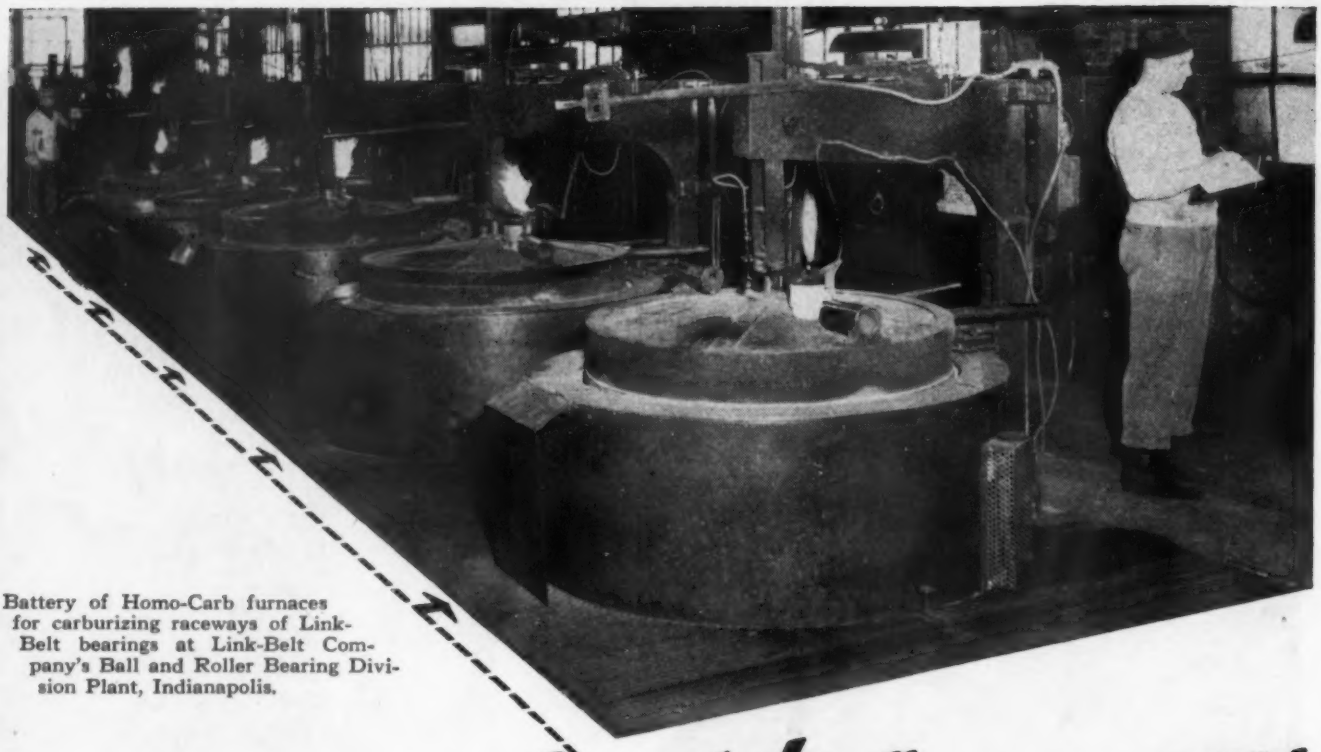
Lastly, Omega's easy to heat-treat, forge, and machine. A winner all the way!

TYPICAL ANALYSIS

C	Mn	Si	V	Mo
0.60	0.70	1.85	0.20	0.45

BETHLEHEM STEEL

OMEGA... one of Bethlehem's BIG 8 Tool Steels



Battery of Homo-Carb furnaces for carburizing raceways of Link-Belt bearings at Link-Belt Company's Ball and Roller Bearing Division Plant, Indianapolis.

A Red Hot Start to a Long Life of SERVICE!

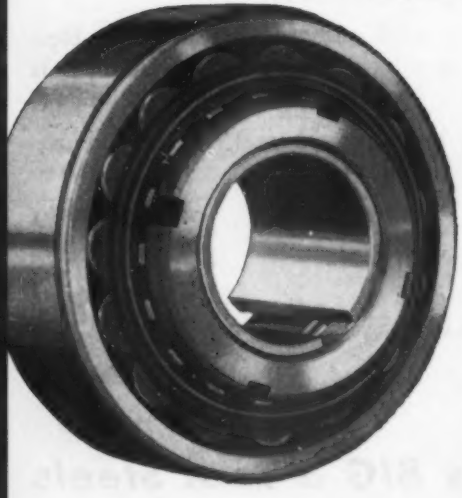
● "Right from the start" Link-Belt bearings are the product of the most scientific processes and precision control of every operation. Heat treatment of the raceways and rollers, under modern instrument control gives the toughness and wearability that assure long life, sustained accuracy and free-rolling efficiency.

Right from the start, and *right* at every stage, is the Link-Belt method, which makes the Link-Belt stamp of Quality your assurance of satisfaction.

Link-Belt bearings are made without mountings in ball and roller types, and as pillow blocks, and cartridge, flanged, take-up hanger or duplex units. Send for engineering data book No. 1775-A.

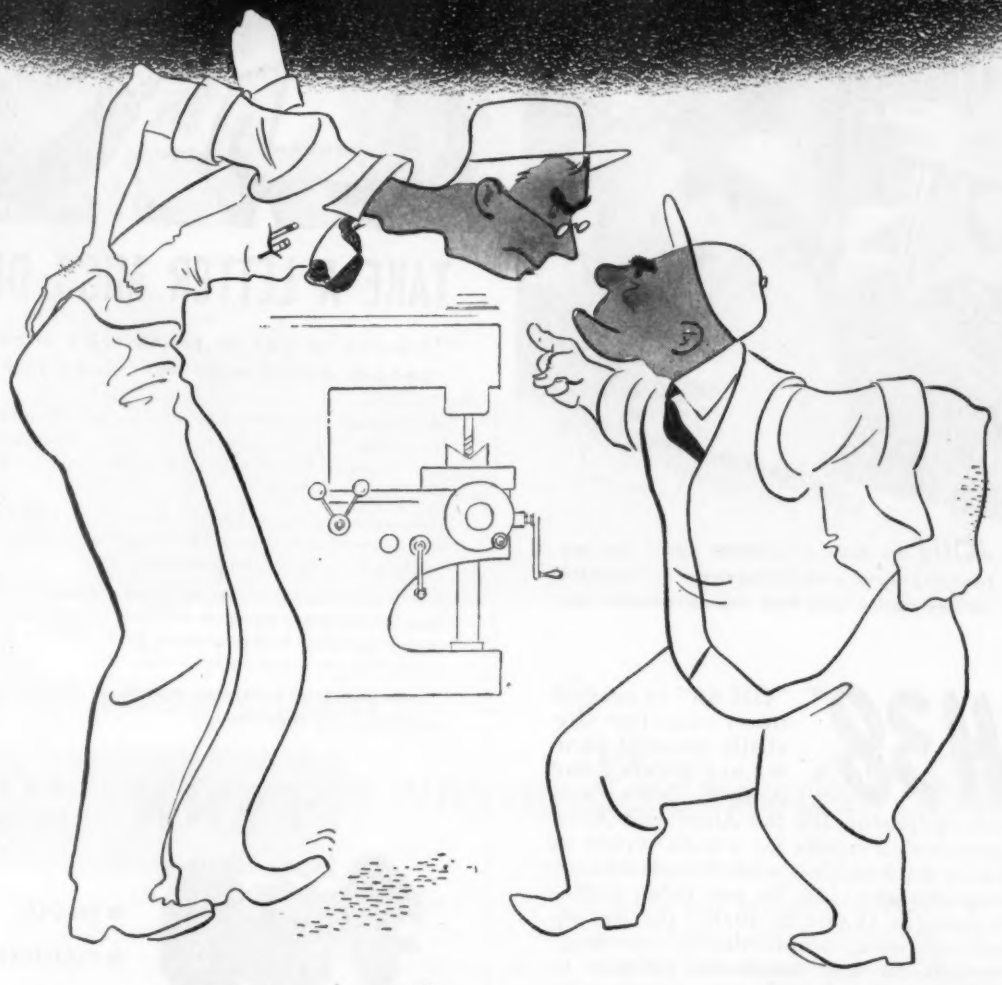
LINK-BELT COMPANY

Builders of the most complete line of power transmission machinery.
Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices, Factory Branch Stores and Distributors in Principal cities. 0949



LINK-BELT
BALL AND ROLLER BEARINGS

You Can Always Count on Arguments



...where there is no COUNTROL

Foreman Fred just caught it hot from the super, for the parts shortage in final assembly. Now Operator Ozzie swears *he* wasn't short . . . he *knows*, because he personally counted every part produced on his machine.

So it goes . . . round and round . . . and gets nowhere. Nor is it Ozzie's fault. *For he can't be counted on, as long as he has nothing to count on.*

But it's a quick, easy and inexpensive matter to *give* him something to count on . . . a Veeder-Root Counting Device that can be installed on his machine without interrupting his production . . . a compact device to count the machine's units of performance (turns, strokes, etc.) mechanically or electrically. Then there'll be no jam-ups or delays . . . and no room for argument, because the Facts-in-Figures will be there, in bold black and white, for anyone to see at any time . . . so machines can be kept up to schedule. *That's* what it means to keep everything under Veeder-Root *Count*ROL.

The Counting House of Industry

VEEDER-ROOT INC.

Hartford 2, Connecticut

In Canada: Veeder-Root of Canada, Ltd., Montreal
In England: Veeder-Root Ltd. (New address on request)

You are needed Now More than Ever!

ACME PHOTO

JOIN the Army of splendid nurses that are rendering superb service in the care of our wounded soldiers coming back from victorious battlefields.

"OH 38"

"OH 38" is needed now, too, for the vitally essential parts we are making for Army and Navy weapons and equipment. It's the Aluminum Alloy that surpasses all others for a wide variety of uses. Easily machinable—holds threads without stripping—weighs .106 lb. per cubic inch—tensile strength 35,000 to 40,000 lbs. per sq. in.—non-corrosive, non-oxidizing, non-magnetic—needs no heat treatment—polishes to mirror brilliancy—takes chrome, nickel or tin plating—may be annodized—many other advantages. Used exclusively in castings by Hedstrom.

SEND FOR COMPLETE TECHNICAL INFORMATION

HEDSTROM

OSCAR W. HEDSTROM CORP.
4812 West Division St., Phone Columbus 3667, Chicago, 51, Ill.
Manufacturers of Aluminum, Brass, Bronze and High Conductivity Copper Castings. Pattern Makers. Complete Mechanical Assemblies and Models to Specifications

TAKE A LETTER MISS DINGLE!

"I want to get in touch with those FENN people about new machines right away."

Many a manufacturer's headache is due to Fear. He is aware that while his old style machines may be getting by in the "production-at-any-cost" wartime era, an entirely different situation will be created by after-war competition.

Fenn designs and develops special machinery for a wide range of industrial uses — efficient, simplified machines that are modern in conception and built to save money on production.

Special machines that we have designed and built during the war have been instrumental in aiding the war effort by cutting costs and reducing time of operation, thereby increasing production and speeding delivery — the vital job of industry right now.

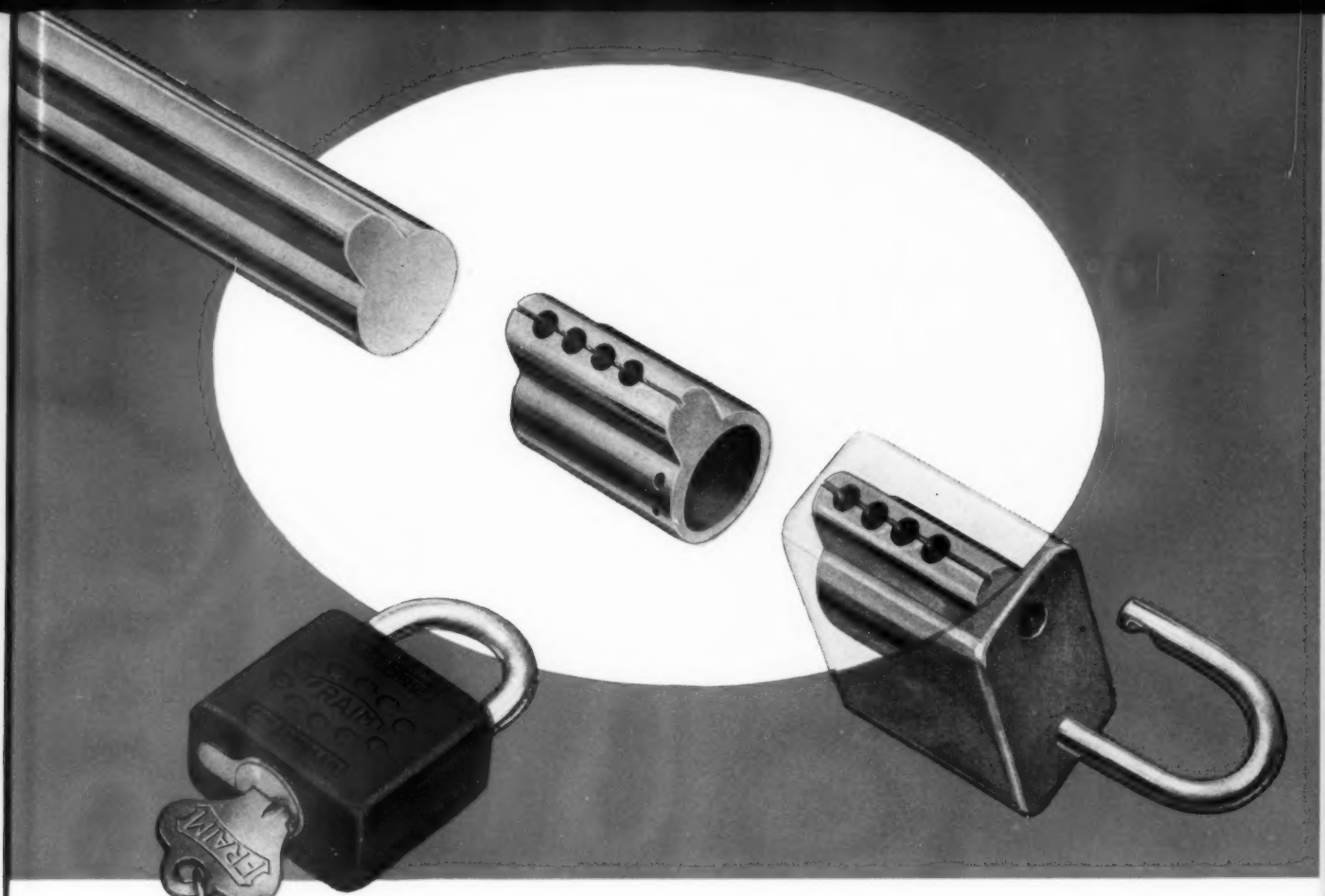
If you have a special machinery problem we invite you to consult with our Engineering Department.

FENN SPECIAL MACHINERY

- TOOLS
- FIXTURES
- MACHINE PARTS
- SPUR GEARS
- INTERNAL GEARS
- GUN PARTS
- AIRCRAFT PARTS
- SUB-ASSEMBLIES
- QUICK ACTION VISES
- SPECIAL MACHINERY

THE FENN MANUFACTURING CO.
HARTFORD, CONNECTICUT

Special Machinery For Efficient Production



Here again—
the answer was an *Extruded Shape*

The E. T. Fraim Lock Company of Lancaster, Pa., has a world-wide reputation for the manufacture of high grade locks, built to unusually accurate specifications. When large-scale production of pin tumbler padlocks for the Armed Forces was undertaken recently, a review of design and materials became necessary.

The component parts—pins, tumblers, springs, case, shackle, bolt, plug and keys—all could be produced readily and in adequate quantities . . . that is, all but the brass sleeve with its unusual shape. And there *was* a problem!

Brass castings were being used, requiring machining all over for the intricate assembly. Lack of uniformity, coarse grain structure and surface roughness and irregularities left much to be desired.

The solution was found in the Anaconda Extruded and Drawn Brass Shape illustrated above. Here was wrought metal, smooth of surface and uniformly accurate in cross section. Sleeves could be "sliced" off long mill lengths—and the parts would fit drill jigs and milling fixtures without filing or fussing. Several operations, previously necessary, were entirely eliminated. Rejections were held to a minimum. And as in so many similar instances, the uniform grain structure and high rate of machinability of the extruded part made possible faster, more accurate production, saving time and tools.

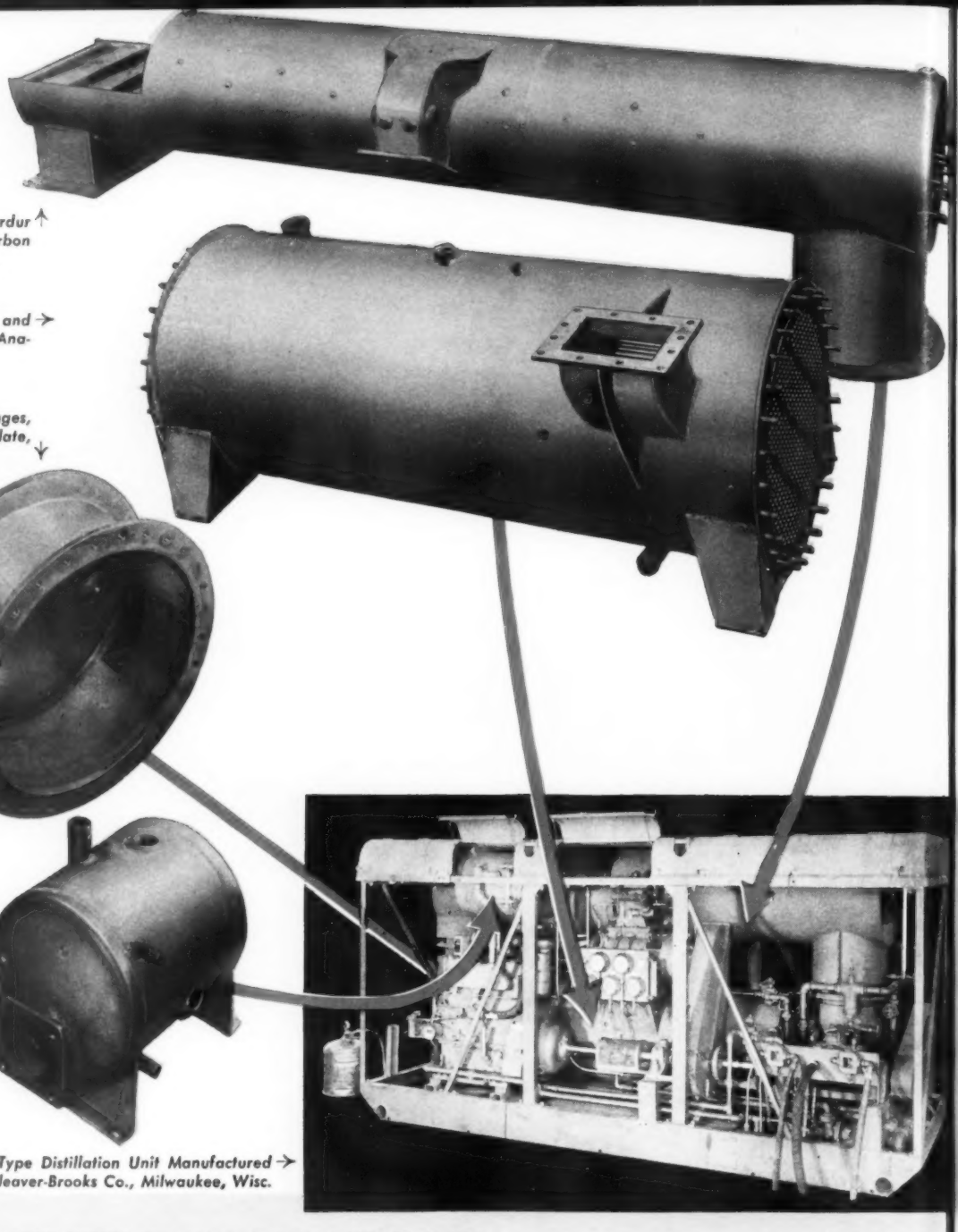
Similar design or production problems may appear in your plant, anywhere from the drawing board to the assembly bench. If they do, remember that our Technical Department will be glad to work with you. 45157

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut
Subsidiary of Anaconda Copper Mining Company
In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

ANACONDA
from mine to consumer

Anaconda Extruded & Drawn Shapes



Evaporator and flume of Everdur sheet-metal construction, carbon arc welded with Everdur rod.

Condenser: Shell, tube sheets and bolts are Everdur; Tubes are Anaconda Arsenical Admiralty.

Discharge Head, including flanges, made of Everdur sheet and plate, carbon arc welded.

Distillate Boiler: All Everdur, including supports and pipe connections. Carbon arc welded.

Compression Type Distillation Unit Manufactured by Cleaver-Brooks Co., Milwaukee, Wisc.

SO THERE'S WATER TO DRINK FOR OUR FIGHTING MEN...

This "seagoing waterworks" uses *Everdur* for ruggedness and dependability

In amphibious operations, this Cleaver-Brooks Compression Type Distillation Unit is among the first items of equipment to be put ashore. From sea water or jungle swamp it will deliver up to 175 gallons of distilled water an hour—pure water for drinking, cooking and other purposes. Little wonder that Everdur Metal is used so extensively and effectively for these important components. For Everdur* has established an outstanding record for service in waterworks and similar fields. It combines strength and corrosion resistance in economical lightweight, welded, sheet-metal construction.

*Reg.U.S.Pat.Off.

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut

ANACONDA
from mine to consumer

Everdur Copper-Silicon Alloy

You'll be seeing much of the new Eastern Stainless blue and black trade mark — E S — reproduced above. Identifying the product of skilled craftsmen — all of whom are specialists in Stainless — it stands for Stainless Steels of superior quality.

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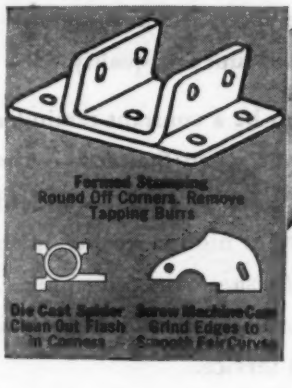
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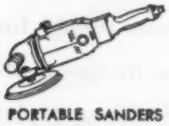

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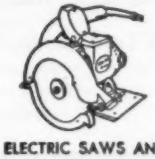

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Yes, when you use Black & Decker Electric Tools, fast "factory" service with genuine factory parts is always within quick reach through one of the factory-owned, factory-operated service branches listed below.

Even under wartime demands for new tool production, we've kept you users of Black & Decker Tools always in mind. Ample production of replacement parts has been maintained to keep your tools on the job . . . just as high standards of precision have been maintained to make parts accurately interchangeable.

For example, if a Black & Decker armature wears out, a nearby Black & Decker Service Branch has an exact duplicate ready to replace it for you quickly. That means a minimum of time-out for repairs, plus freedom from the risk of burn-outs that come from hit-or-miss armature rewinding. The same quick interchange can be made on gears, housings and other parts.

This nation-wide "factory" service is one more reason why any Black & Decker Tool gives you more value, more dependability, more satisfaction for your money. There's a distributor near you. The Black & Decker Mfg. Co., 616 Penna. Ave., Towson 4, Md.

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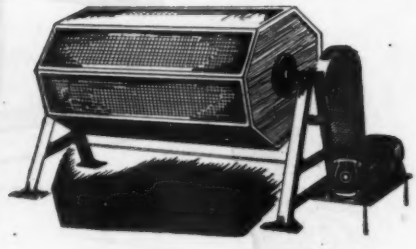
PORTABLE ELECTRIC TOOLS

MACHINING DATA ON PLASTICS

6. TUMBLE SCREENING

(PART ONE OF TWO PARTS ON TUMBLING)

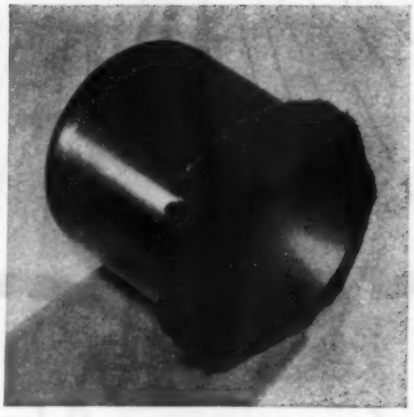


This is the sixth in a series of messages designed to better your knowledge about the machining and finishing of molded phenolics —the most versatile of all plastics . . . the type of plastics which Durez has specialized in producing during the past quarter century.

When a molded phenolic part is ejected from the mold, in most instances, it is completely finished except for the "fin" which occurs at the flash point. Under normal conditions the fin thickness averages .015" and if located on the edge of the molded piece, is removed by a process referred to as "tumbling."

Tumbling Barrels

Open type tumbling barrels are usually round or hexagonal in shape and are constructed from heavy wire mesh or perforated metal. This type barrel is recommended in preference to the solid closed barrel because of the fact that when the flash breaks off from the molded part, it becomes pulverized and is extremely difficult to clean from the surfaces of the tumbled parts.



Typical Durez phenolic molded part before the fin has been removed by tumbling.

Recommended Procedure

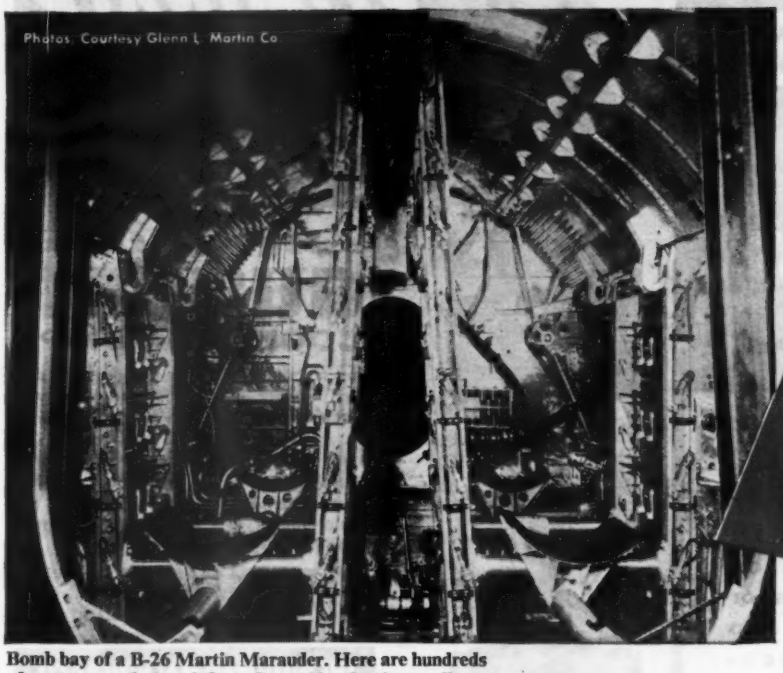
For best results, barrels should be loaded at least 75% full. This is especially true when the molded parts have metal inserts or are large. If too small a quantity is tumbled, the parts will be subjected to too much drop with excessive breakage and damage to the inserts as the consequence. In the case where the molded parts are very lightweight, it is advisable to tumble them with medium sized wooden blocks to speed up the process of fin removal.

Time Factor

Recommended speed for the tumbling barrels is 40 to 70 RPM. The time required depends on many factors—type of material, design and shape of piece, thickness of fin, and the amount of charge in the barrel. Under average conditions, 10 minutes tumbling is sufficient for proper removal of fin from a Durez phenolic molded part. The benefits of the vast experience which Durez technicians have acquired during the past quarter century are available at all times toward furthering your progress in the machining and finishing of phenolic plastics. Durez Plastics & Chemicals, Inc., 536 Walck Road, North Tonawanda, N. Y.

PLASTICS THAT FIT THE JOB

How Up-To-Date are you on ALUMINUM?



Bomb bay of a B-26 Martin Marauder. Here are hundreds of parts manufactured from Reynolds aluminum alloys.

Parts made from bar, tubing, castings, sheet, forgings, and extrusions—basic forms turned out by Reynolds.

Reynolds offers great new alloys . . . startling new advantages in strength-weight factor

ALMOST OVERNIGHT aluminum has come of age. Today, it's tough, strong, enduring! Actually, new aluminum alloys developed by Reynolds metallurgists, possess unit strengths greater than most structural steels . . . yet, section for section, they weigh only ⅓ as much. In addition, these new alloys are highly resistant to corrosion. *Now the use of aluminum is practicable for entire constructions!*

R301

Reynolds tough armor plate alloy—tomorrow's great sheet and plate alloy! Write for Special Bulletin 50-A. Gives characteristics, properties, other important reference data.

R303

Exceedingly high tensile yield strength. Developed primarily for extrusion and forging stock. Available also in bar, rod, and sheet. Special Bulletin 54-A gives complete technical data.

R317

Combines free machining qualities with high strength. Age hardens at room temperature after solution heat treatment. Good corrosion-resistance. Write for Special Bulletin 55-A.

CONSIDER ALUMINUM. Consider the special opportunities—inherent in the new Reynolds aluminum alloys. Consider ease of fabrication . . . thermal and electrical conductivity . . . reflectivity . . . non-magnetic, non-sparking and non-toxic qualities . . . pleasing appearance . . . new low costs. And, finally, consider Reynolds nationwide production and service facilities.

See Reynolds catalog in Sweet's . . . or write for Catalog No. 100. Reynolds Metals Company, Aluminum Division, 2521 S. Third Street, Louisville, Ky. *Consider aluminum*...**CONSULT REYNOLDS!**

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TRADE MAXITORQ MARK

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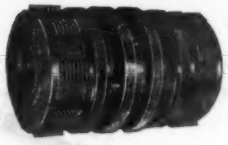


WET OR DRY TYPES

SO COMPACT . . .

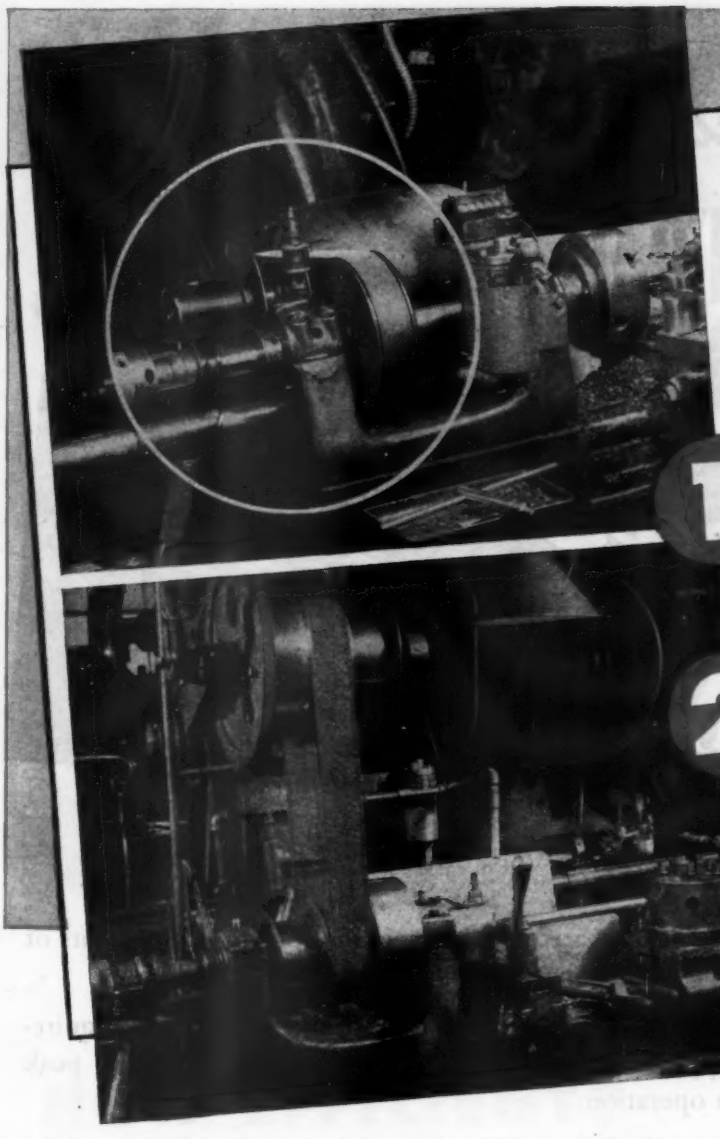
One of the many reasons why prominent machine tool builders specify Maxitorq is its compactness . . . so much clutch in such small area. For instance, overall dimensions of the No. 21—¼ H.P., single clutch are but 2⅝" dia. x 3" . . . the No. 26 5 H.P., 6-3/16" x 5".

In addition . . . *no tools are required,* either for assembly, adjustment or take-apart. Floating discs are held apart in neutral by patented Maxitorq Separator Springs . . . "you can see between them". Therefore, no drag, abrasion or heating.

Give us your clutch problems for solution . . . ¼ to 5 H.P. @ 100 R.P.M. . . . larger capacities to order.

SEND FOR CATALOG NO. A62

THE CARLYLE JOHNSON MACHINE COMPANY MANCHESTER CONNECTICUT



Case History OF TWO MACHINES

1 with REEVES SPEED CONTROL

2 without SPEED CONTROL

Here are two hand screw machines, both doing the same types of work—yet one is much more versatile, much more capable of accurate, speedy production than the other. One is equipped with a compact REEVES Vari-Speed Motor Pulley, permitting operation at any speed desired—at turn of handwheel, to meet requirements of different kinds and sizes of stock, different operations, etc. With the other the turning speed is *fixed* at a definite number of revolutions per minute —changeable only, *in steps*, by shifting belt from one pair of pulleys to another.

The second machine was later equipped with a REEVES Vari-Speed Motor Pulley for complete flexibility.

The advantages of REEVES Variable Speed Control, on all types of production machines, are universally recognized. Not so well known, however, is the ease and facility with which standard REEVES units can be installed on machines in service. Since these units are made in many sizes of three different designs there is usually no difficulty in selecting and installing the correct unit, at minimum cost, and with a minimum requirement of time.

There's a REEVES Speed Control engineer near you, to help solve your installation problem. Write us.

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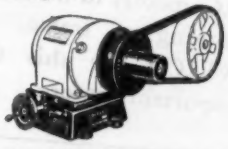
The 3 Basic Units in the REEVES LINE

Variable Speed Transmission for providing infinite, accurate speed flexibility over wide range. Send for Catalog T-443.

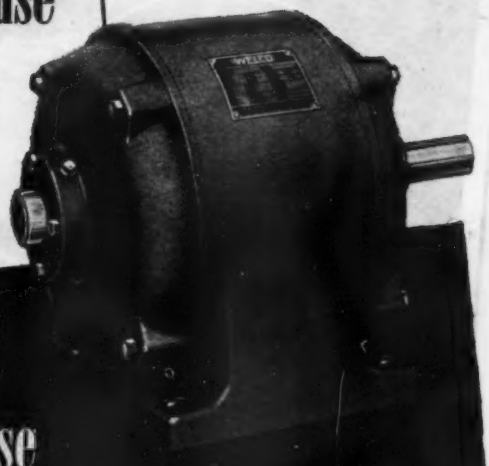


Vari-Speed Motor Pulley converts any standard constant speed motor to a variable speed drive. Send for Catalog V-440.

Motodrive combines motor, speed varying mechanism and reduction gears in single compact unit. Send for Catalog M-441.

REEVES *Accurate Variable* Speed Control

Correct because CUSTOM TAILORED



Correct because CUSTOM BUILT

Custom-tailored suits are made to meet the special requirements of the man to be fitted. The result is peak perfection in dress.

Custom-built motors, likewise, are built to meet the special requirements of appliances, machines and devices. The result is peak efficiency in operation.

That is why Welco Torque Motors are so much in demand by the manufacturers whose products require the special powering that standard motors cannot provide. A WELCO Torque Motor, specially built for your special powering requirements, will give your product the advantage of peak efficiency—top performance. We build them up to 75 H.P.

Our engineers will gladly consult with you regarding your special powering problems. *Write Today.*

EXCLUSIVE FEATURE

The "Uni-frame" construction of WELCO Torque Motors provides for an easy interchange of A.C. and D.C. motors to fit the same housing or frame. Only WELCO has this vitally important feature.

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Morse research has developed positive chain drives to transmit power from a fraction of a horsepower in an intricate and delicate scientific instrument up to 5000 horsepower in a single drive.

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Tank and gun mount gears merely present another version of the "strong yet compact" problem Sier-Bath has often solved in its 40 years of manufacturing gears. They call for accurate machining and heat treating the higher strength alloys—adhering to extra fine tolerances, metallurgically as well as dimensionally. Sier-Bath is equipped with the machines, the furnaces, and the craftsmen to do similar jobs for you in gears 2" to 52" in diameter. Inquire today.

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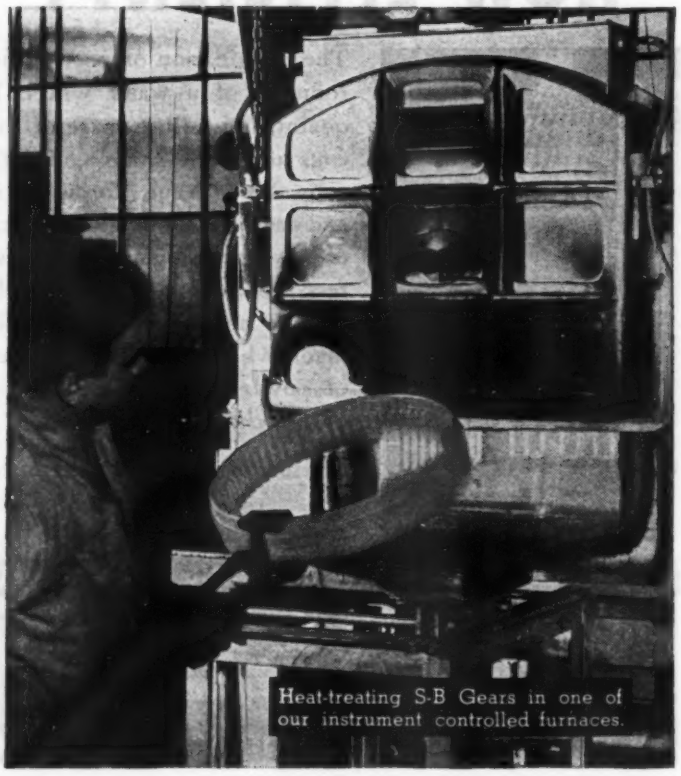

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A Statement of Fact for Buyers of Precision Gears

We manufacture precision gears to customers' specifications. The gears have a high finish, and the tolerances are as close—or better—as the specifications indicate. Our production equipment, comprising the finest, modern machine tools, occupies a space in excess of 250,000 square feet. Thus our facilities are ample to meet practically any demands for the mass-production of precision gears. A highly efficient inter-departmental follow-up system enables us to steadily maintain an unusually high percentage of delivery promises. Finally, our engineers almost always manage to devise methods and equipment for the production of *special* gears, if the means for doing the job are technically feasible.

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Helical Gears

Bevel Gears, Ratchets,

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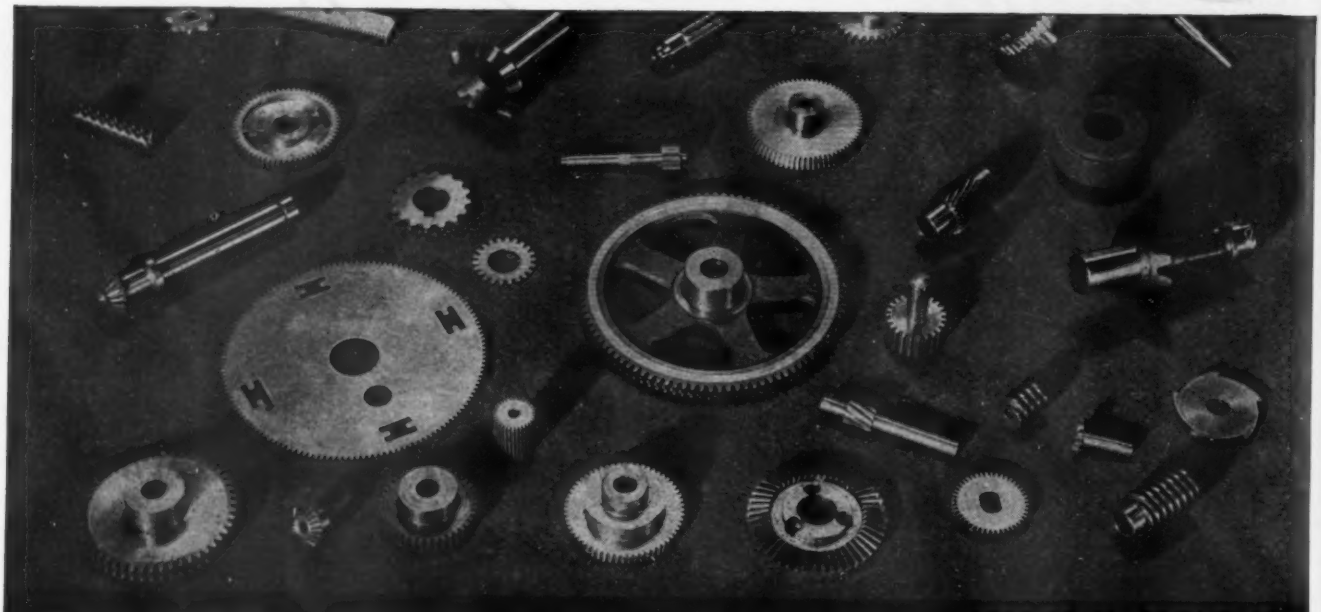
PERKINS *custom-cut* GEARS

PERKINS MACHINE & GEAR COMPANY, SPRINGFIELD 2, MASS.

Quaker City Gears Are Rolling with the Armed Forces on All Fronts



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We carry a complete stock of standard cut gears and can furnish special gears to your specifications.

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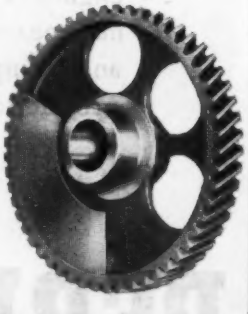
Of especial importance is the fact that Cincinnati Gears are made to fit your particular requirements, from your specifications. Take advantage of the big "Plus Factor" in Cincinnati *Gears, Good Gears Only* . . . it saves time and money and puts the right gear in the right place.

- ★ SPUR
- ★ BEVEL
- ★ HELICAL
- ★ SPLINE
- ★ WORM
- ★ SPECIAL



THE CINCINNATI GEAR COMPANY
"Gears . . . Good Gears Only"
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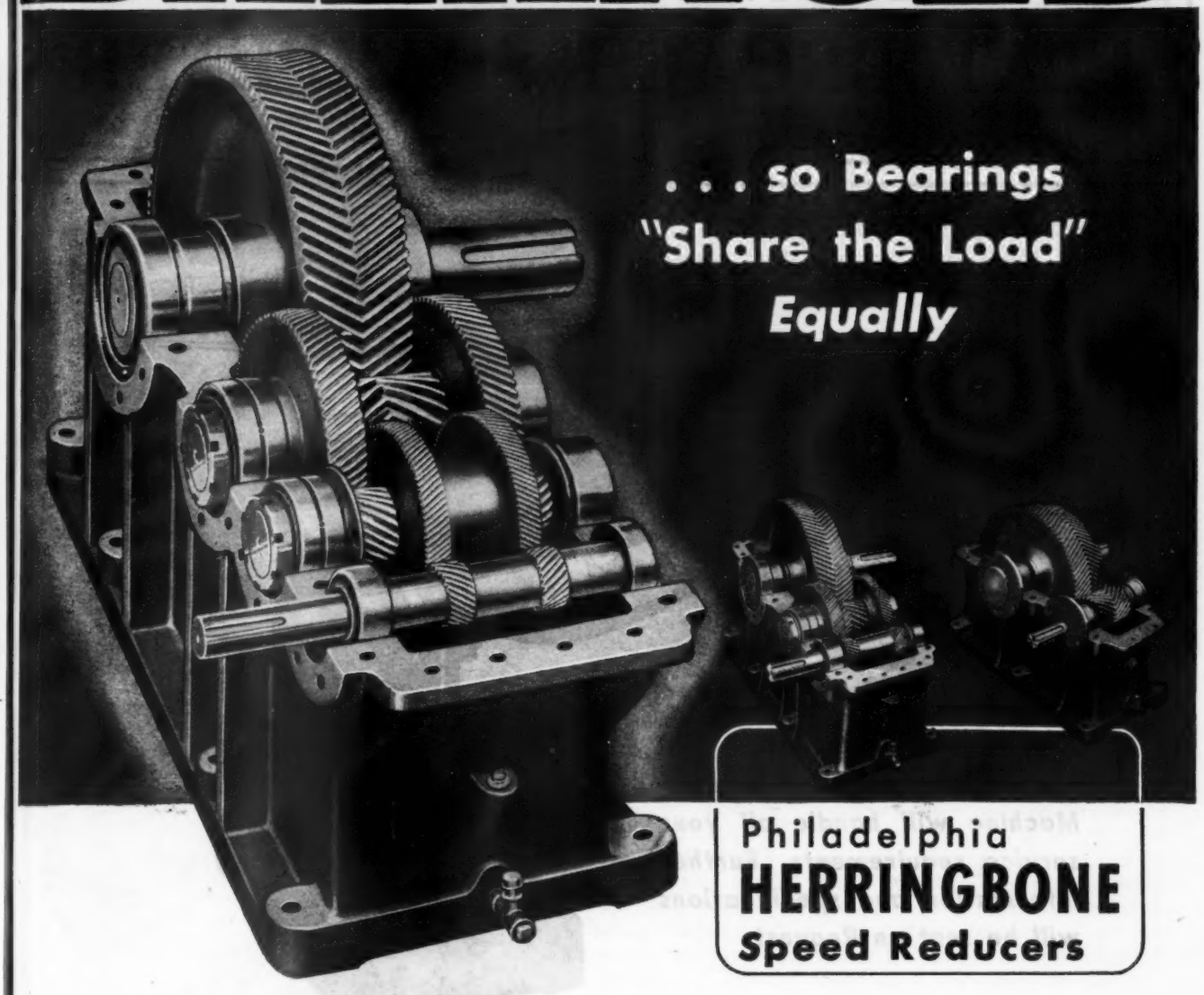
BALANCED



Philadelphia HERRINGBONE Speed Reducers

Indicative of the well planned design features of Philadelphia Herringbone Reducers is the gear arrangment in the Double and Triple types. In these, the gears are located symmetrically with respect to the centerline of the housing rather than the offset arrangement. Two standard bearings are provided on each shaft with each bearing absorbing an equal load. Offset arrangements of herringbone gears would result in unequal bearing loads, while a similar arrangement of single helical gears imposes an additional load by the thrust action.

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For complete construction details get our Catalog H-39. Please write on your business letterhead.

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These gears represent a new advance in design and production methods. They assure greater mechanical efficiency, lighter weight, quieter operation, greater compactness. Applied to the machinery and equipment you are manufacturing or planning to manufacture, they will assure many competitive advantages—help you solve many engineering problems. Foote Bros. engineers will be glad to consult with you on the application of these new developments in power transmission to your product.

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WORM GEARING • THREAD GRINDING
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and the way MEISEL builds gears, there's just one *right* gear for any specific job. Designed for use under conditions that exist, MEISEL Gears actually "belong" to a machine . . . are inherently able to give longer, quieter, more economical service. Investigate the advantages of *specifically* engineered gears by MEISEL.

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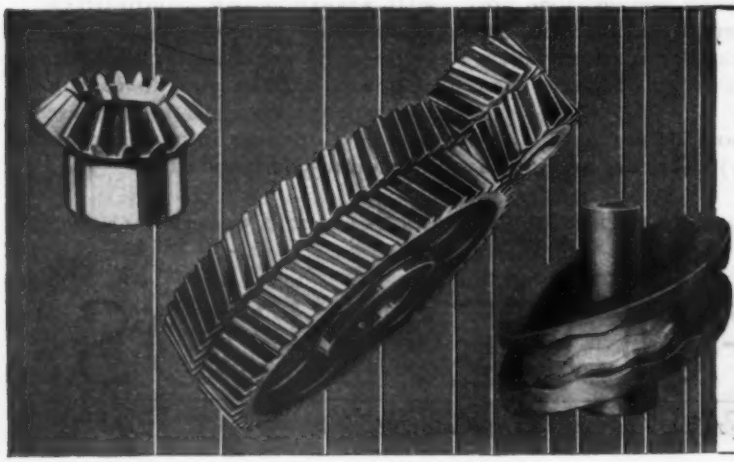

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You can have these four essentials of production and still not make a usable or salable part, yet proper application of all four results in a superior product.

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The Illinois Gear trademark on your gear means it's a "Five Star Gear." ★ Material double-checked. ★ Cut by a highly skilled craftsman. ★ Required accuracy inbuilt. ★ Double-inspected after completion. ★ Delivery as promised.

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"The mark on Finer Gears"

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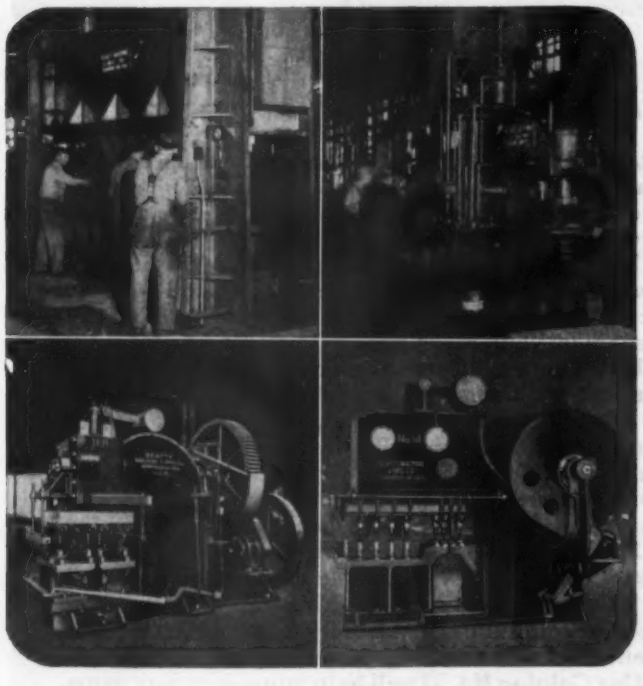
● **BEATTY engineers spend a lot of time in greasy overalls, solving heavy metal working problems at close quarters. That's why you are assured of a better solution when you bring your problem to a BEATTY engineer. Our wide experience may prove invaluable to you.**



Representative units from the complete BEATTY line of heavy duty punches, presses, shears, coping machines, benders and bulldozers.

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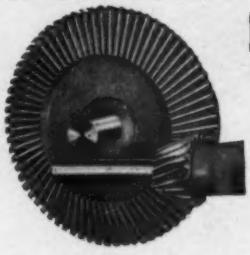

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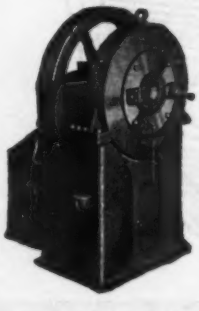

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— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

The Torrington Co., Swager Dept.
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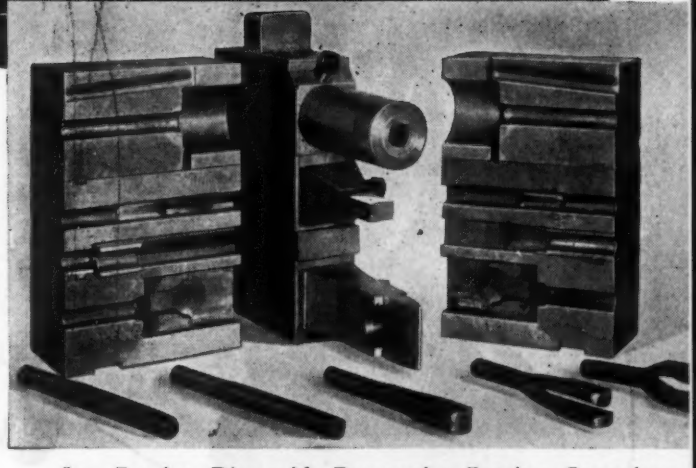
For Fast Economical Production of Jaw Forgings

Ajax Forging Machines are of exceptional value in the production of a wide range of jaw forgings, particularly so on the ends of long rods.

In some instances, with a small size upsetter, the end of the bar is simply balled up or gathered for subsequent drop forging of the jaw in a hammer or forming in a forging press.

Where the size of the machine is ample and the jaw design suitable, it can be completely forged in the upsetter in dies similar to those illustrated. After gathering, the stock is split by the action of the die slide by closing with suitable splitting knives carried in the gripper die. After that the jaw is brought to finished form by a final upsetting operation.



Jaw Forging Dies with Progressive Forging Operations.

As a third method, where production does not warrant outlay for the somewhat complex dies with slitting knives or where the jaw is large in relation to the size of the forging machine, the slitting operation can be performed on an Ajax Hot Sawing and Burring Machine or with a cutting torch.

Write for Bulletin No. 65-B

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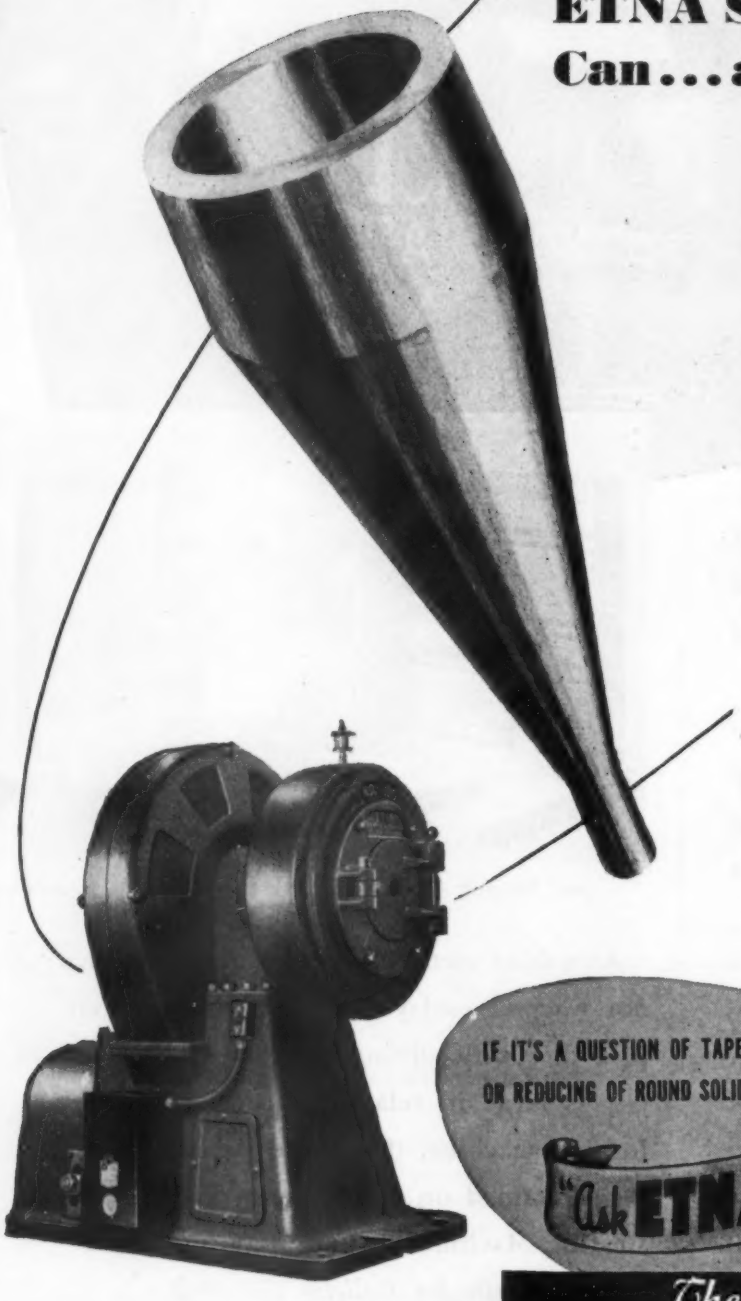
Can you produce this part... without machining?

ETNA SWAGING UNITS Can... and do!



● Almost any part we can name, that involves complicated tapering, sizing or reducing operations can be produced quickly, easily and with extreme accuracy on ETNA Swaging Machines—without resorting to machining. Swaging will greatly reduce production time and costs in your plant . . . first by eliminating certain preliminary machining operations, and, second, by savings, in material — for with Swaging no metal is cut away. Rather it is compressed, thus strengthening the metal structure.

A note to ETNA today describing your tapering, sizing and reducing problems will bring complete, descriptive material on the advantages of Swaging as applied to your particular operations.

IF IT'S A QUESTION OF TAPERING, SIZING OR REDUCING OF ROUND SOLIDS OR TUBING

"Ask ETNA about Swaging"

The ETNA Machine Co.

3400 MAPLEWOOD AVENUE

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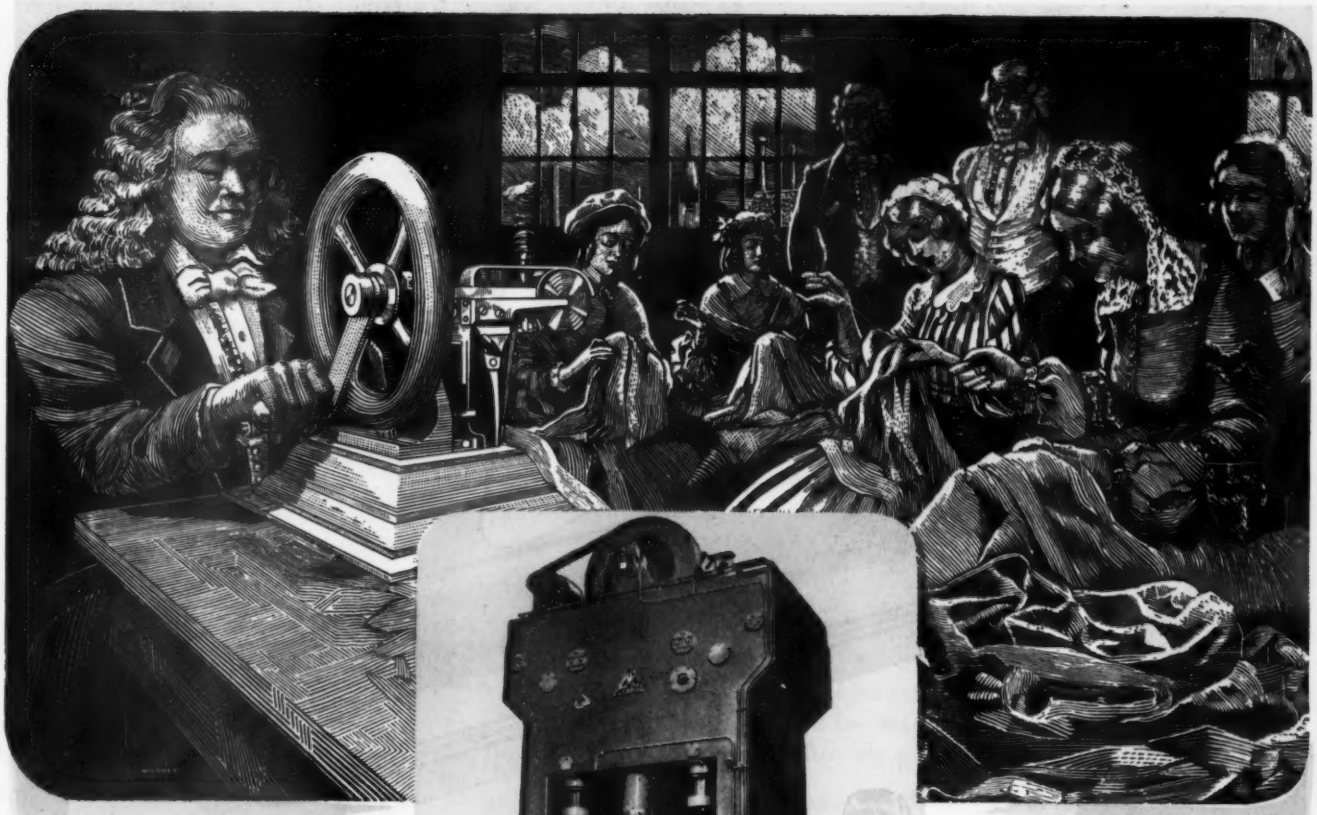
ETNA Swaging Machines are built in standard sizes with maximum capacities from 3/8" to 6"—die lengths up to 18" for tapering, sizing and reducing of hollow, solid, round or angular parts. Larger sizes are built to order.



DEATH OF A FALSE NOTION

Preconceived ideas often die hard. When Elias Howe developed his sewing machine its value was not readily recognized because it was considered no novelty; sewing machines had been used for certain rough work long before 1846. It took a contest with five expert seamstresses to prove that this sewing machine was different—that it could do fine work, accurately and fast, with stitches that were ingeniously locked and would not pull out.

Before the first Clearing Press was built, press operations were limited to relatively small parts of light gauge metals; designers avoided difficult shapes and deep draws, and could ask for only large dimensional tolerances. But Clearing Presses wrought a marvelous change—they killed old notions as to press limitations. Unprecedented size, speed and accuracy are now proved and commonly attained realities.

Clearing Presses today are doing many a job which "couldn't be done on a press"—saving time and money for manufacturers in many lines. If you are not familiar with the possibilities of truly modern press techniques, we invite you to get in touch with us.

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MECHANICAL AND HYDRAULIC PRESSES

FOR SUCH OPERATIONS AS DRAWING • BLANKING • FORMING • FORGING

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Presteel Solves a Problem for Typewriter Manufacturer

This manufacturer had always made its own stampings, and had tooled up to produce the steel ribbon cover shown above. Difficulty was experienced in providing enough metal for the rear overhang without wrinkling the top surface. So Presteel was called into the picture, and—as usual—solved the problem.

This manufacturer, incidentally, uses Presteel Cold Rolled Strip Steel for much of its own stamping production.

Few industries have not availed themselves of the services of the Worcester Pressed Steel Company. In all likelihood Presteel has contributed to the development of interchangeable parts for many of the machines in your own offices and shops. Why not investigate the possibilities for lowering costs and improving the quality of your own products by the use of Presteel metal stampings. Mail samples or prints to:

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ALLOY STEELS AND OTHER METALS COLD FASHIONED SINCE 1883

For Piece or Production Work Wherever Force Is Needed

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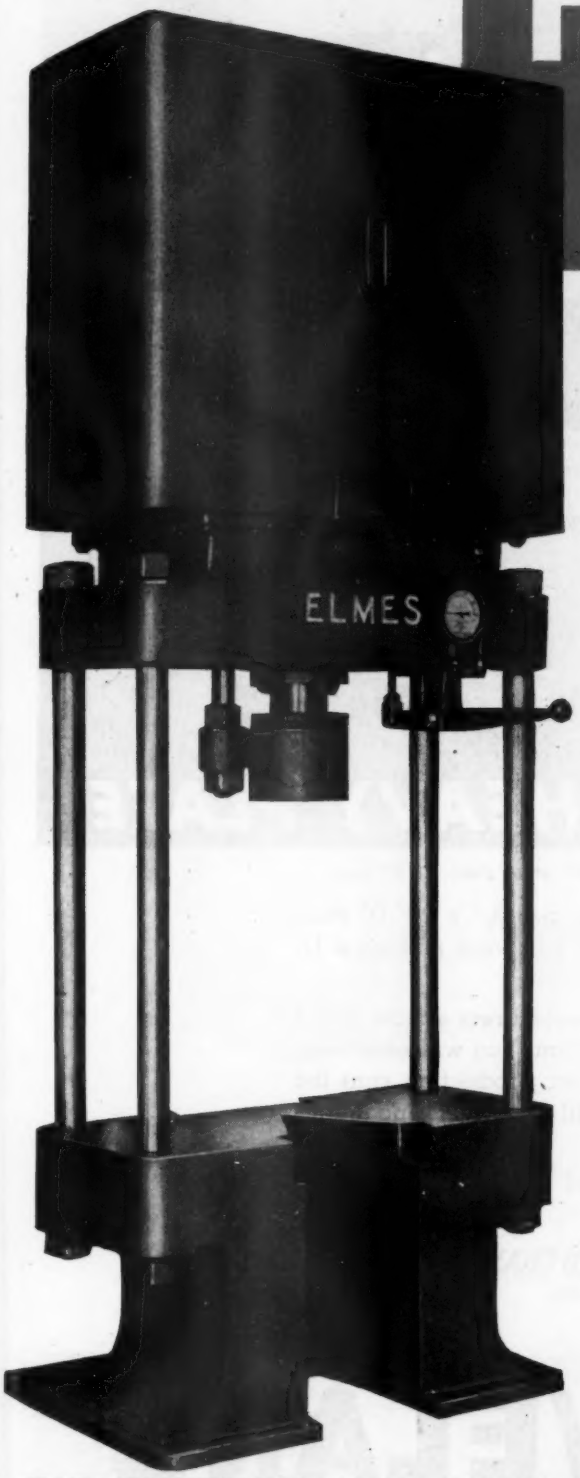

Pressure — *when* you want it, *where* you want it, *as* you want it—that's what you get from Elmes hydraulic forcing presses.

In railroad shops, and wherever heavy assembly or repairs call for power to produce, Elmes *smooth dependability* makes difficult tasks routine. For pressing gears on or off shafts, for inserting or removing bushings, and for other force fits and forcing work, Elmes speed and versatility save valuable time . . . Elmes sure control stops *costly spoilage.*

Types include the four-column design (illustrated), open-side models, horizontal forcing presses, inclined wheel presses, and hand or power operated portable units. All are quickly adjustable to piece size and service needs. Ask us for Bulletin No. 1055. Today is none too soon to plan on *cutting costs.*

ELMES HYDRAULIC EQUIPMENT

Elmes four-column forcing press, Model No. 6297, a very sturdy, self-contained, lever-operated unit with motor and pump mounted aloft. The rapid-travel plunger moves to and from work quickly. Pressing speed is operator controlled. Notched bed plate takes removable V-block; solid plate and work fixtures, optional. Multiple rows of piston rings seal power, never need replacing. Elmes forcing presses range up to 600 tons, and larger.

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Model L 5½-12 Steelweld Press bending 5/16" steel plate, 20'-0" long

How long does it take you to weld or rivet two $\frac{5}{16}$" x 20'-0" steel plates together at right angles? How long if you were making a U-shaped or Z-shaped item?

For work of this sort you will find a Steelweld Press a most useful tool. It will cut time and cost to a small fraction. You will save even when you only have occasional odd jobs. For production runs the reduction in time is tremendous. And you will save rivets and angles or welding rod and power too.

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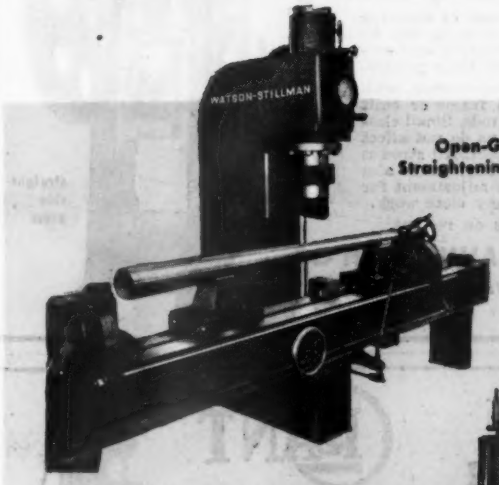

Open-Gap Straightening Press

Horizontal Forcing Press

Single-Action Forming Press

Horizontal, Metal Extrusion Press

Whatever kinds of metal fabrication your production may require . . . the comprehensive line of W-S hydraulic equipment includes types and models of presses and auxiliaries that can help you speed production on many metal working operations.

The presses shown here are but a few of the many produced by Watson-Stillman to perform a wide diversification of jobs. Industrial engineers and production executives will recognize the unlimited possibilities of using W-S presses for:

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Watson-Stillman manufactures accumulators, intensifiers, pumps, forged steel valves and fittings, and other auxiliary equipment needed for the installation and operation of complete hydraulic systems. The Watson-Stillman Co., Roselle, New Jersey.

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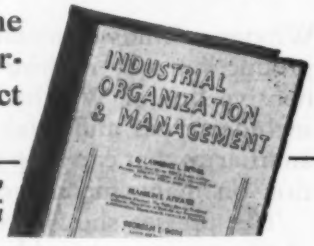

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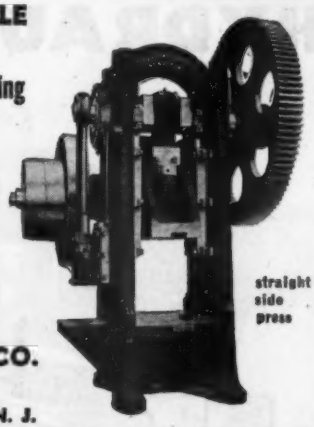

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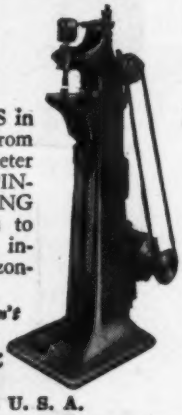

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Do Important Machining Jobs in 1/2 to 1/7 the Time!

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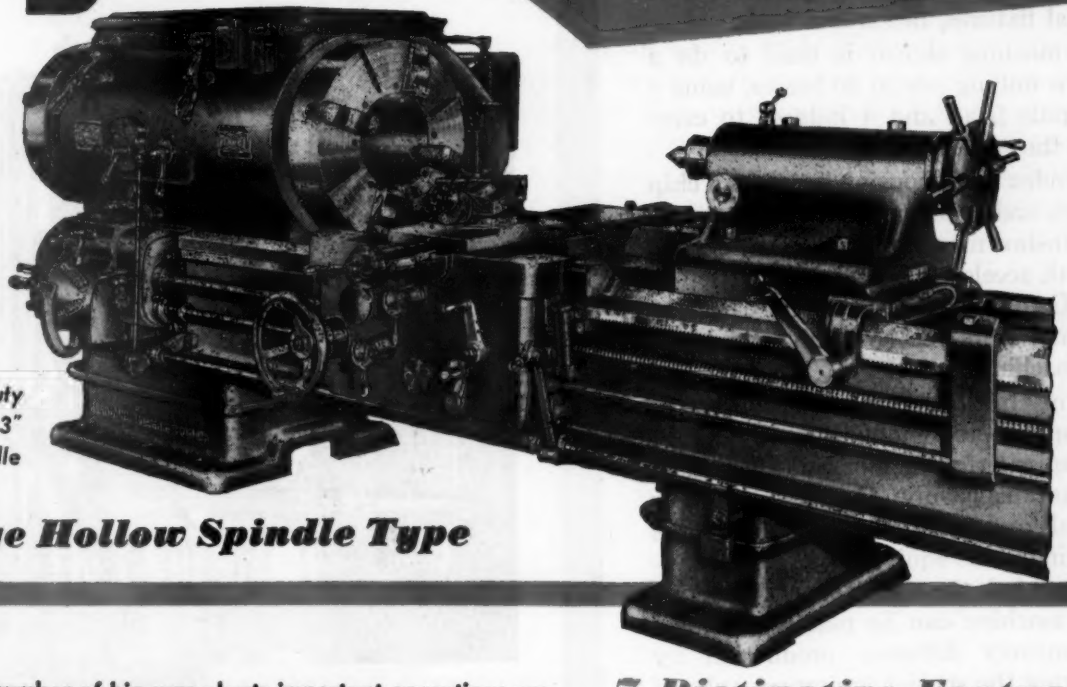

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Large Hollow Spindle Type

Yes, in a number of big war plants important operations are being performed in 1/2 to 1/7th the time of previous operations. In one plant, Large Hollow Spindle Type of HYDRATROL LATHES are saving 15,000 man hours per month! Why not let us show you what a HYDRATROL LATHE could do in your plant?

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Medium	**24" up to 12" Hole**	**Large**	**36" up to 16½" Hole**
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(Standard Type lathes, 16" to 36")

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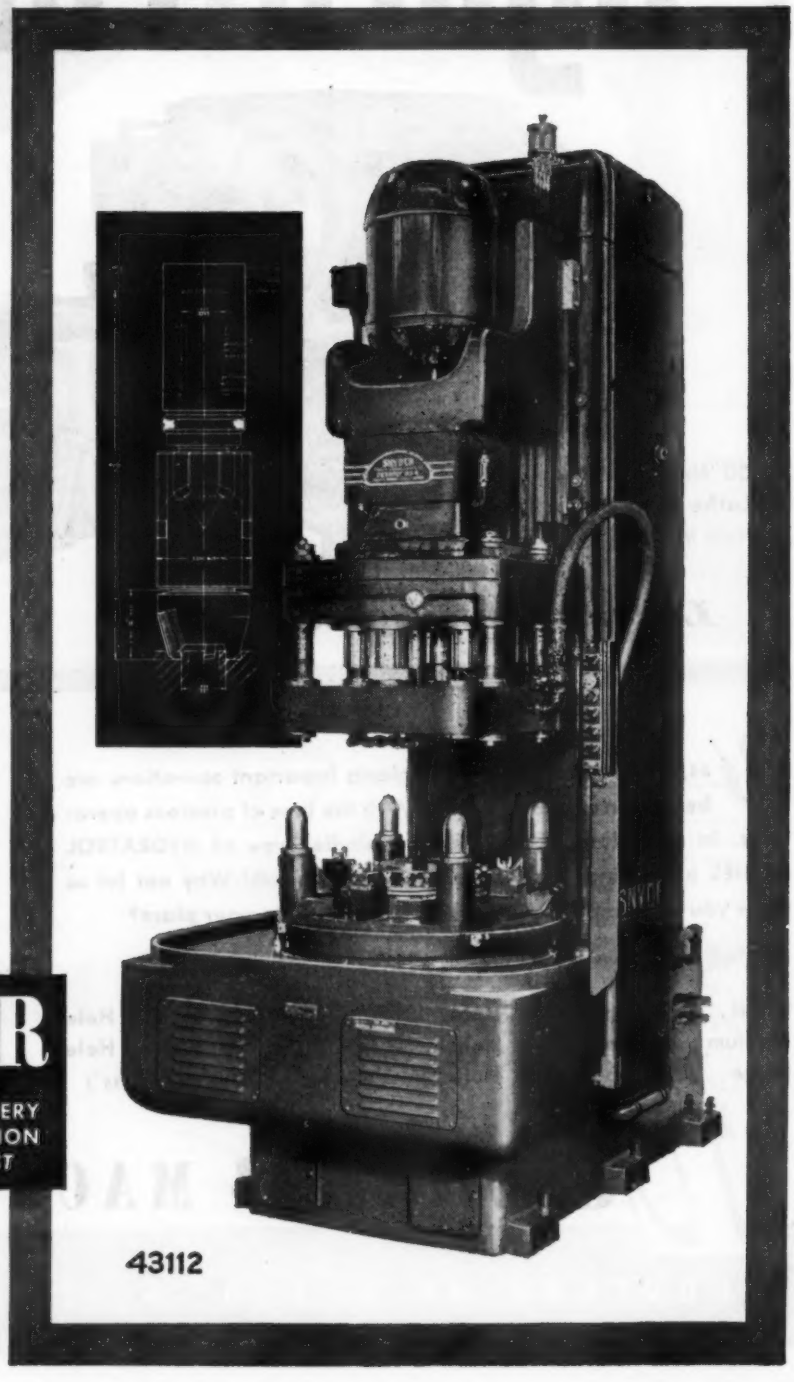
The machine shown is used to do a hollow milling job on 20 bosses, using a 5-spindle head and 4 indexes to complete the work cycle.

The index table housing serves as a chip trough and coolant retainer. The standard index mechanism provides the smooth acceleration and deceleration of the Geneva wheel, hydraulically powered from the hydraulic system of the machine itself.

This machine is available with or without special tooling and speed change transmission for single or multiple spindle adaptations. Only the equipment is special, and, with such equipment this machine is the equivalent of a special—at about half the cost of such a machine. This machine can be readily re-tooled for entirely different production by changing the special equipment only. If production is your problem, write, wire or 'phone *Snyder Tool & Engineering Company, 3400 E. Lafayette Ave., Detroit 7, Michigan.*

Snyder Standard Drilling Machine with Special Equipment Saves Up to 50% of Special Machine Price



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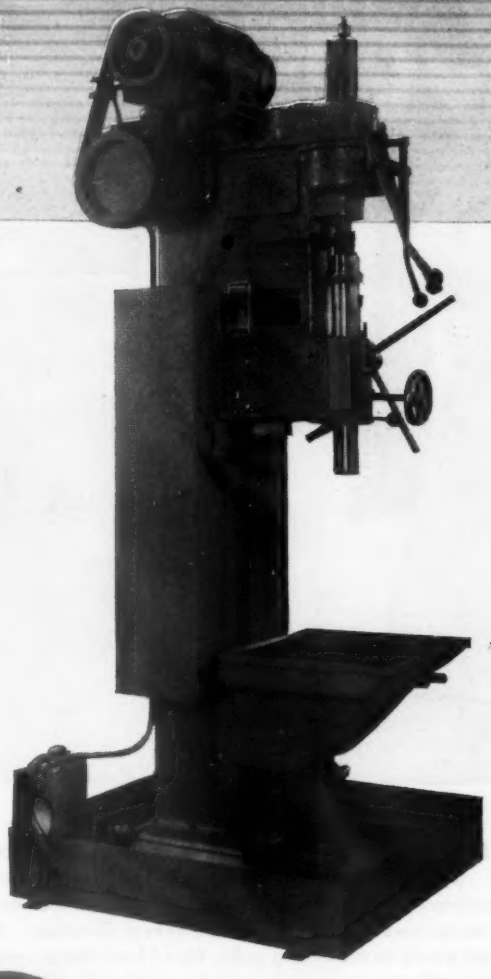

You'll be interested in the BAKER Quick Change Drill from a standpoint of capacity, range and ease of operation. These units are adapted to boring, counterboring, facing, forming and tapping and will produce equally fine work on all these operations. Spindles are arranged to take both light and heavy tools and multi-splined driving gears insure smooth, powerful action.

In the light of your needs we attach real importance to the features listed below.

1 The vertical two-piece frame construction makes possible the addition of spacer blocks between lower and upper frame in the event that extra clearance is needed.

2 A wide range of feeds and speeds is offered. Units are arranged with twelve quick changes of speed. Three speed change control levers make possible instantaneous changes. Feeds range from .005 per revolution to .143 per revolution. BAKER geared feed heavy duty drills can be furnished with special gears to give positive lead for tapping.

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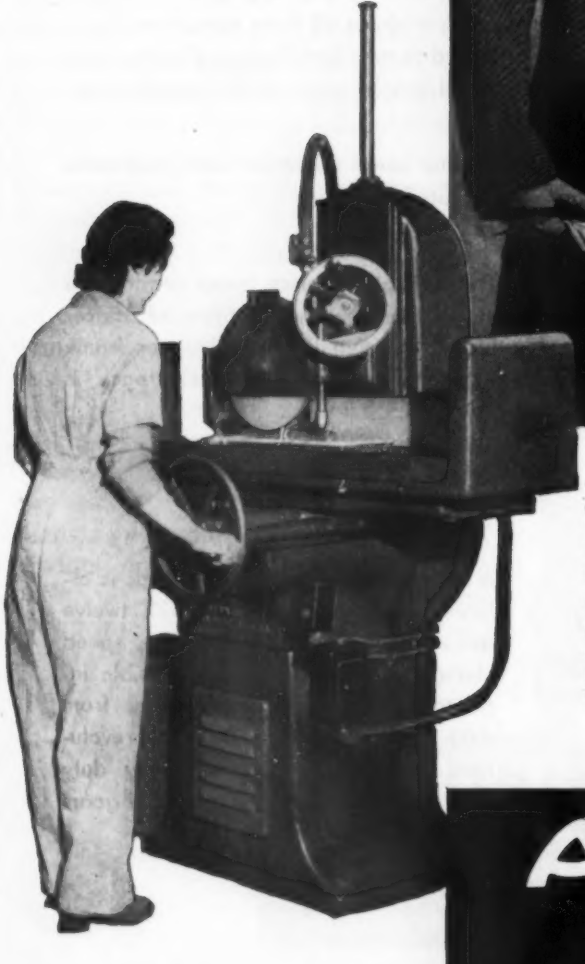
No. 1½

IS ALWAYS ON THE JOB



Simple hand operated controls make the No. 1½ an ideal, safe machine for unskilled operators.

ABRASIVE No. 1½ Surface Grinding Machine turns out a good day's work every day . . . year after year. Its heavy one-piece bed casting, an ABRASIVE feature, is assurance of long dependable service. Motor mounted directly on the spindle means fewer moving parts . . no belts or sprockets . . less vibration and maximum power at the cutting point. Hand feed design speeds toolroom grinding jobs; convenient controls and large handwheels permit maximum output on the production line. Recommended for the most precise type of flat, form and gage grinding. Unusual capacity up to 15″ long x 10″ WIDE x 12″ high.

BULLETIN ON REQUEST

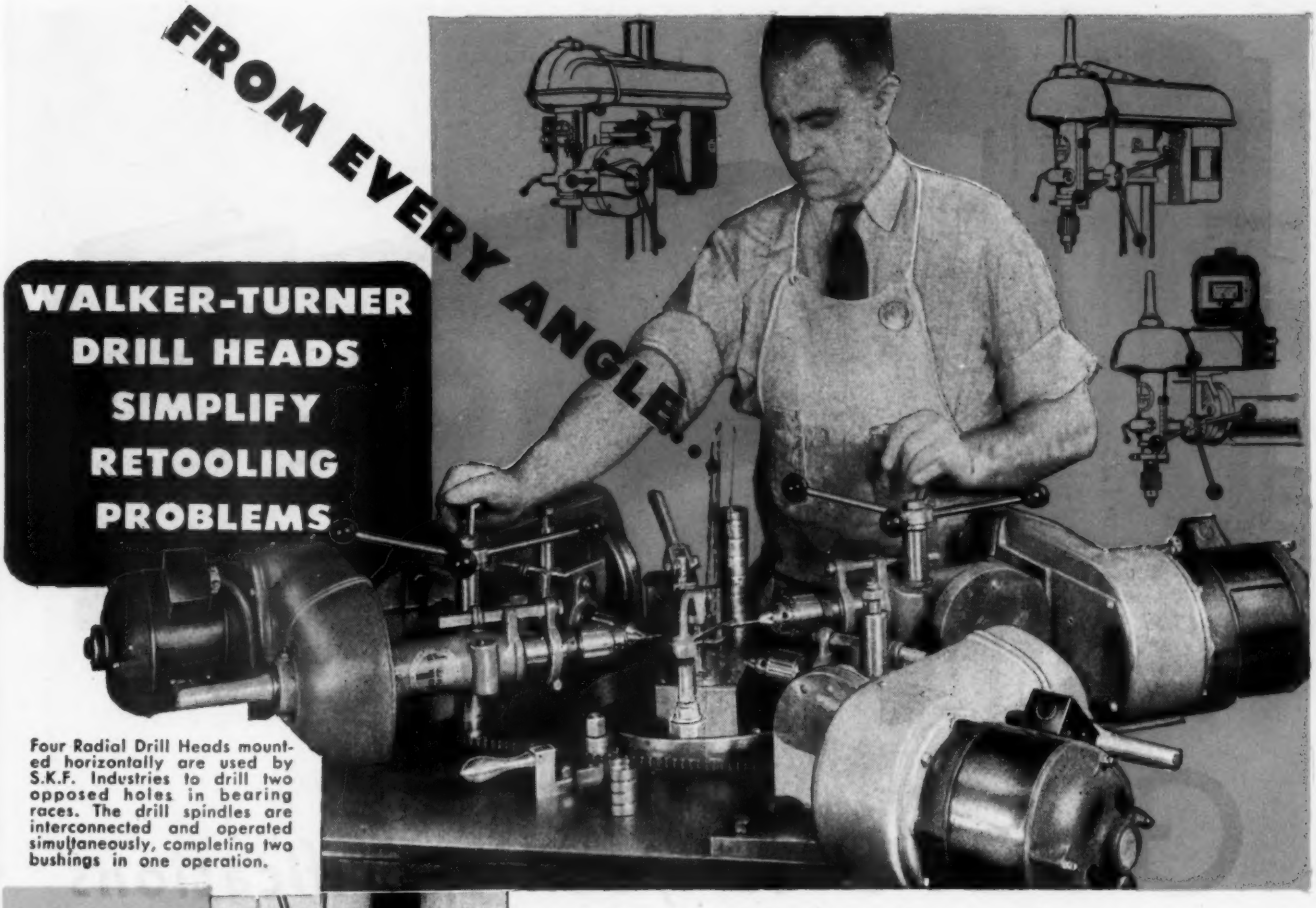
ABRASIVE

ACCURACY BOOSTS PRODUCTION

ABRASIVE MACHINE TOOL CO. • EAST PROVIDENCE 14, R. I.

FROM EVERY ANGLE...

WALKER-TURNER DRILL HEADS SIMPLIFY RETOOLING PROBLEMS



Four Radial Drill Heads mounted horizontally are used by S.K.F. Industries to drill two opposed holes in bearing races. The drill spindles are interconnected and operated simultaneously, completing two bushings in one operation.

Two Radial Drill Heads working in conjunction to rough grind lens blanks to specified curvature.

20" Drill Head converted to a highly efficient Jib Drill does the work of a 12 foot Radial.

Check These High Spots:

- Operate vertically, horizontally, at any angle — even upside down.
- Careful selection of materials, superior design, rugged construction, assure long service at high level of precision.
- Speed ranges from 85 to 8300 R.P.M.
- Safe, simplified operation.
- Low initial cost—low power consumption—low maintenance.
- Handle Metals, Plastics, Wood, Ceramics, Glass.

For a faster reconversion when the time arrives, it will pay you to look into the tooling possibilities of Walker-Turner Drill Heads, *now!*

Compact, flexible Walker-Turner Drill Heads are available in 20" models (hand or power feed) and 15" models (hand feed or radial). Four ball bearings on splined spindles—full floating spindle pulley — one-piece head casting—many other features—maintain high production and precision, while slashing costs!

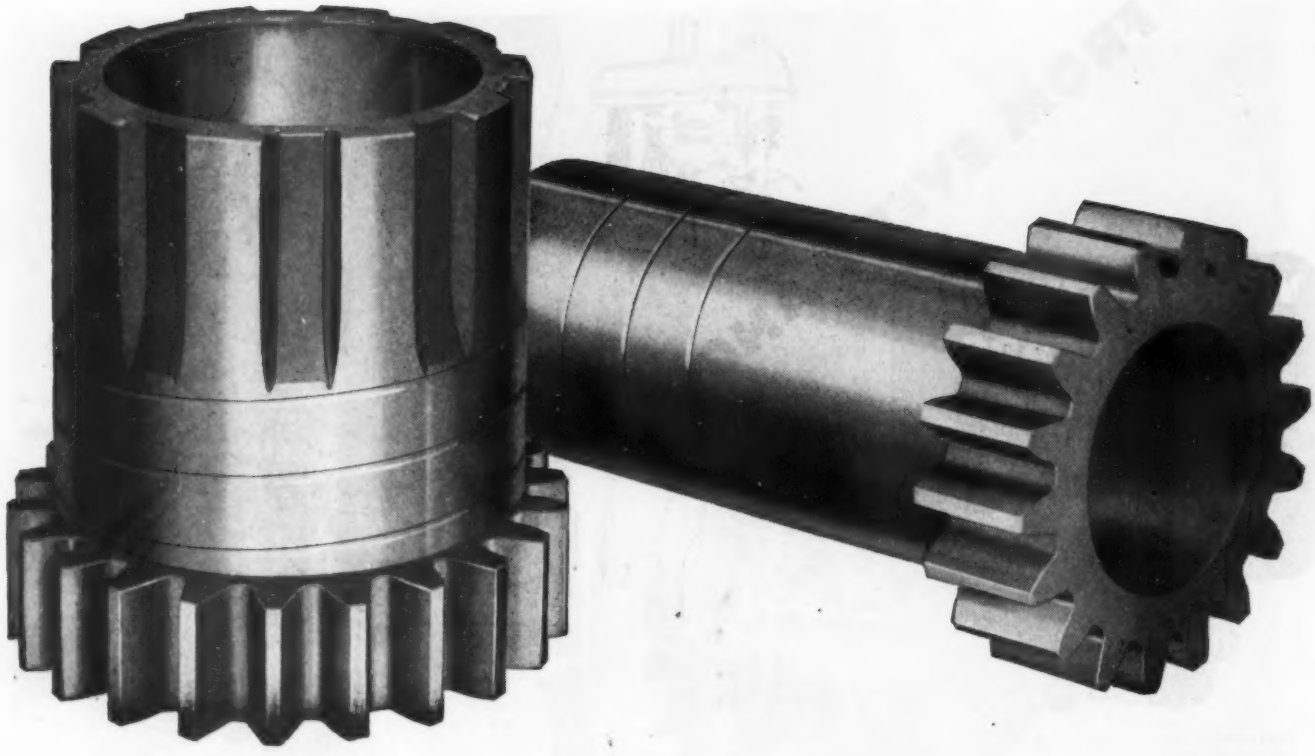
WRITE TODAY FOR FREE, FACTUAL DRILL HEAD FOLDER — shows typical special tooling set-ups — construction details — cutaway drawings — prices.

WALKER-TURNER CO., INC., PLAINFIELD, N. J.

walker-Turner
COMPANY, INC.
PLAINFIELD, N.J.
U.S.A.

MACHINE TOOLS

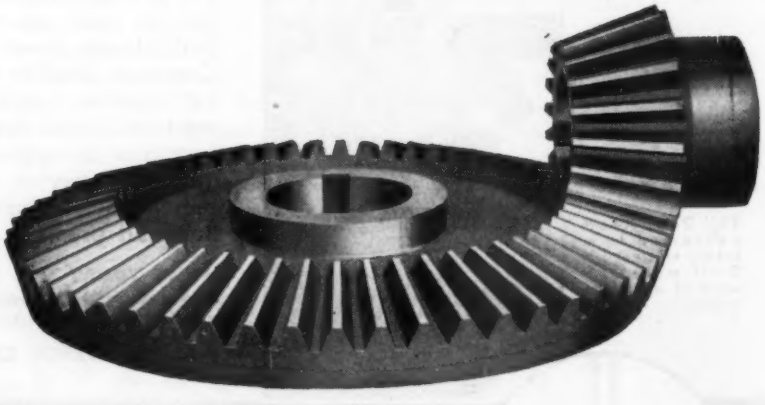
DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS



Gears *to your specifications*

Spur Gears
Helical Gears
Splined Shafts
Worms
Worm Gears
Bevel Gears
Miter Gears
Sprockets
Ratchets
Racks
Lead and Feed Screws

Adams Gears are produced with the finest production and inspection equipment obtainable and they can be furnished to your most exacting requirements.



THE ADAMS COMPANY

1942 BRIDGE STREET — DUBUQUE, IOWA, U.S.A.

1883 — Our 62nd Year — 1945

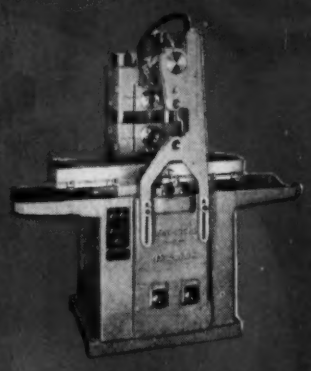
Rugged...

No. 2-20 . . . 20" table travel . . . 42" x 12" table . . . full automatic hydraulic table feed.

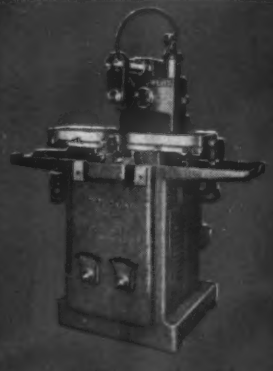
Simple...

No. 2-20V . . . 20" table travel . . . vertical spindle with speed range 32 to 1284 R.P.M. . . . 42" x 12" table.

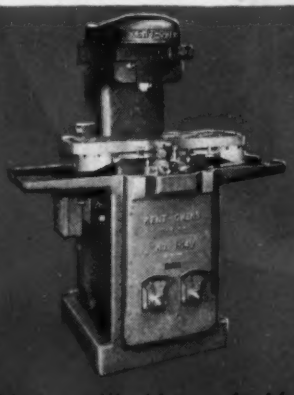
Efficient...



No. 2-20DS . . . Double Spindle for two milling operations at same time . . . 20" table travel . . . 42" x 12" table.



No. 1-14 . . . 32" x 9" table . . . 14" table travel . . . hydraulic table feed . . . full automatic cycle.



No. 1-14V . . . 14" table travel with full automatic cycle . . . vertical spindle with speed range 115 to 3000 R.P.M.

No. 1-H . . . Hand feed to table and head . . . 25" x 9" table . . . 1 H.P. . . . head counterbalance is adjustable.

Cost-cutting Dependability with

KENT-OWENS

Milling Machines

Write for Bulletins • KENT-OWENS MACHINE CO., TOLEDO, OHIO

No. 1-V . . . Hydraulic vertical head feed . . . 5½" head travel . . . 25" x 9" table.

No. 1-8 . . . 8" table travel . . . 25" x 9" table . . . full automatic hydraulic table feed.

KENT-OWENS REPRESENTATIVES

BOSTON
General Machinery Corp.

BUFFALO
Don W. Pomeroy

CHICAGO
Noll, Kohlbusch & Bissell

DALLAS
Hamilton-Hunter Mach'y Co.

DAYTON
Geiger Mach'y Company

DETROIT
A. C. Haberkorn Mach'y Co.

GRAND RAPIDS
Joseph Meadows

HOUSTON
Oliver H. Van Horn Co., Inc.

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MINNEAPOLIS
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NEW ORLEANS
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TORONTO
F. E. Barber Mach'y Company

WALKERVILLE
F. E. Barber Mach'y Company

IN THE SPOTLIGHT

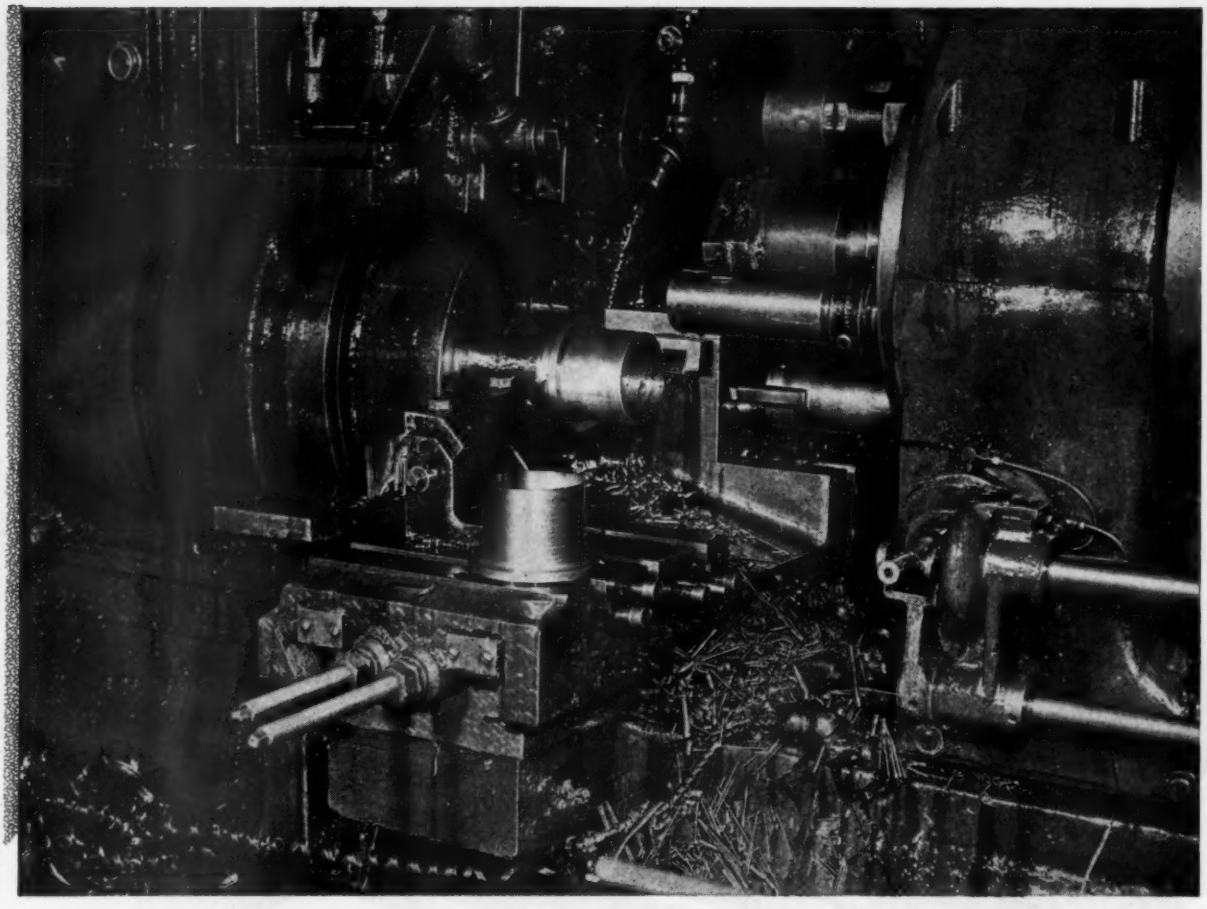
Occupying a prominent place on the production line of American Industries is the standard type AVEY Drilling Machine. Sturdily built to give longer operating hours, smoother performance and lower maintenance. A wise investment because it does your war job now—your peace job later, with no time out for conversion.

This Avey Drilling Machine, Type MA-6, is now being built in No. 2 size (capacity in cast iron, 7/8"). No. 3 size (capacity in cast iron, 1¼"). One to six spindle units, either size. Six speed machine, two speed motor with three mechanical changes through gearing. Speed range is eight to one. Push button control. The above photograph shows the MA-6 equipped with three spindles, the Aveymatic Feed, Hand Feed and Tapper.

THE AVEY DRILLING MACHINE CO.
CINCINNATI, OHIO, U.S.A.

CINCINNATI · OHIO

Avey DRILLING MACHINES



ONE SETUP ON A CLEVELAND AUTOMATIC DELIVERS THIS PART, IN 52100 STEEL

If you want to produce parts like this for profit, remember this simple setup on a Cleveland 5¾" Model A Automatic . . . STOCK: 4⅛" bars of 52100 steel . . . TOLERANCES: .003" overall . . . TOOLS: carbide, in five turret stations and two cross-slide mountings . . . SEQUENCE: 1 . . . Gauge stock; 2 . . . rough turn two diameters OD and centerdrill; 3 . . . rough out ID and flat bottom from turret and finish-form two ODs from rear cross-slide; 4 . . . rebore ID and finish flat bottom, start cutoff from front cross-slide; 5 . . . finish ream, complete cutoff. Part is delivered faster than by any method previously used. Machine automatically proceeds with next piece. A total of 16.9 lbs. of metal is removed. The 5¾" A is but one of the versatile Cleveland line, with capacities from 9/16" to 10" described in a new bulletin, available on request.

Just Remember . . . Clevelands Cut Costs

CHICAGO (6):
1408A Civic Opera Building
DETROIT (2):
540A New Center Building
NEW YORK (6):
1806A Singer Bldg.
CINCINNATI (12):
4932A Beech Street
HARTFORD (1):
529A Capital National Bank Building

THE CLEVELAND AUTOMATIC MACHINE CO.

TOMORROW always comes!

Axelson Lathes, of various lengths, are manufactured in 14, 16, 18, 20, 25 and 32-inch sizes.

The proverbial idea that tomorrow "never" comes is frustration . . . A play upon a word . . . A denial of the obvious . . . For tomorrow ALWAYS comes . . . And with tomorrow a new day filled with new promise . . . Today as the war clouds blow away and final Peace, like a benediction, draws closer, many postwar problems crop up . . . In the post-war era competition will be keen . . . *Quality* will be the watchword . . . Demands for quality products will create a demand for equipment that will unerringly deliver quality on a fast, accurate, versatile basis with greatest economy . . . In metal turning this points straight towards the time tested Axelson Heavy Duty Lathe with its quality-first background, stretching over the past thirty years. Write for Bulletin 4401, which tells you all about this superb machine tool.

AXELSON LATHES

Dependable for over a Quarter Century

ARMY E NAVY

THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

AXELSON MANUFACTURING CO.

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BUY WAR BONDS

See this New 30-Minute Movie and Save Months of Postwar Planning

Gorton Presents "An Exact Duplicate"

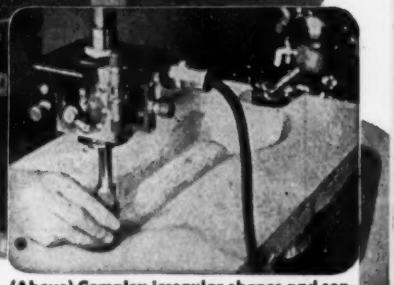
30 MINUTES OF LATEST TECHNIQUES IN "TRACER-CONTROL"

MILLING...DUPLICATING...ENGRAVING..

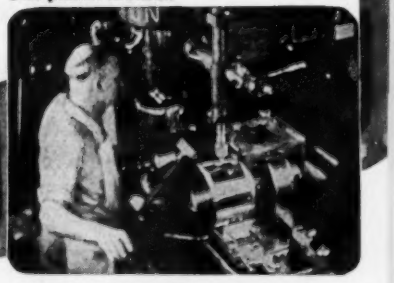
This new Gorton Sound Motion Picture, in colors—"An Exact Duplicate"—shows latest techniques on many jobs like those you'll tackle after "V-E Day."

Yes, the 30 minutes that you'll spend seeing "An Exact Duplicate" may give you the practical solution to that tough postwar production problem that is on your drawing board today. This motion picture, filmed in color and sound under actual machine shop conditions, shows Gorton Tracer-Controlled Machines *in use* on plastic die and mold jobs, forging dies, high production profiling, milling, 2 and 3 dimensional engraving and manual and electric duplicating.

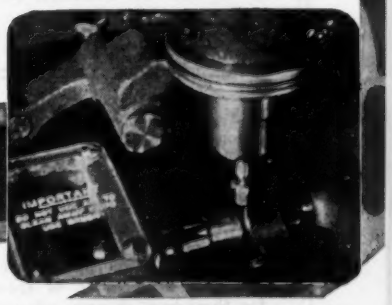
Available now without charge—for showing to technical societies, company groups, conventions, training schools, and other organizations. Write us today for further information, giving choice of three tentative dates.



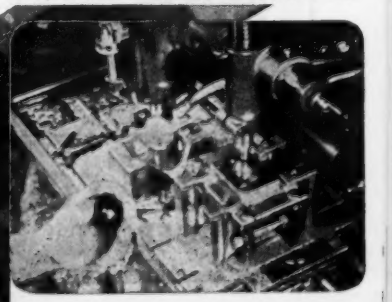
(Above) Complex irregular shapes and contours are easily duplicated from inexpensive plaster models.



(Above) Flexibility of Duplicator Control solves many industrial problems.



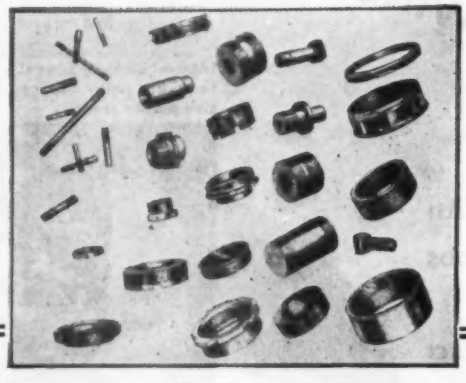
(Above) A revolutionary idea in grinding.



(Above) It is simple to do production profiling of parts which must be held to close tolerances.

GEORGE GORTON MACHINE CO.

Any parts that can be chucked can be threaded on the COULTER HOB THREAD MILLER



. . . a universal machine for automatic production of internal or external right or left hand threads

Hob Threaded work can be handled with speed and precision on this rigid, simple fully motorized machine. The variety of work it is capable of handling is almost unlimited because any parts that may be held by chuck or special fixture can be threaded. The design of this machine is such that long work can also be accommodated.

Work and cutter spindles are each driven by individual motor, a wide range of speeds and feeds being available for threading of parts of various materials. Once the machine has been started on the first piece, the entire operation is automatic until time for unloading.

Explore the possibilities of the "Coulter" on your external and internal threading by writing for further information.

THE JAMES COULTER MACHINE CO.
BRIDGEPORT, CONNECTICUT

KEYSEATING
The Modern Way

Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1¼" in width.

Great simplicity and ease of operation of Davis Keyseaters assure the user of accurate, time saving work.

Let our engineer study your keyseating problems.

DAVIS KEYSEATER COMPANY
403 EXCHANGE ST. ROCHESTER, N. Y.

FOR GREATER SPEED RANGE, SENSITIVITY AND EASE OF OPERATION . . .

HAMILTON
"VARIMATIC"

. . . SUPER SENSITIVE, VARIABLE SPEED DRILLING MACHINES!

★

LOW RANGE
Min. Spindle Speed 849 — Max. Spindle Speed 2700

HIGH RANGE
2890 — 9800

DRILL CAPACITY
.004" to 5/16"

Here's a unit built with "instrument precision", fully capable of handling the finest work for both defense and peacetime production. Combining sensitivity and ease of operation, the "VARIMATIC" allows instantaneous, variable speed adjustment in two ranges. (Speed changes are accomplished by means of a hand wheel. A graduated dial on hand wheel shows the speed at which the spindle is operating.) A letter will bring complete details—write!

The Hamilton Tool Co.
830 NINTH ST. HAMILTON, OHIO

More Than Double Drill Life

Eight Times More Holes per Grind

Over 90% Saving in Drill Cost

TYPE 4-G . . . CAPACITY UP TO 2" DIA. ON 2, 3 OR 4 LIP DRILLS

LLERS DRILL GRINDERS

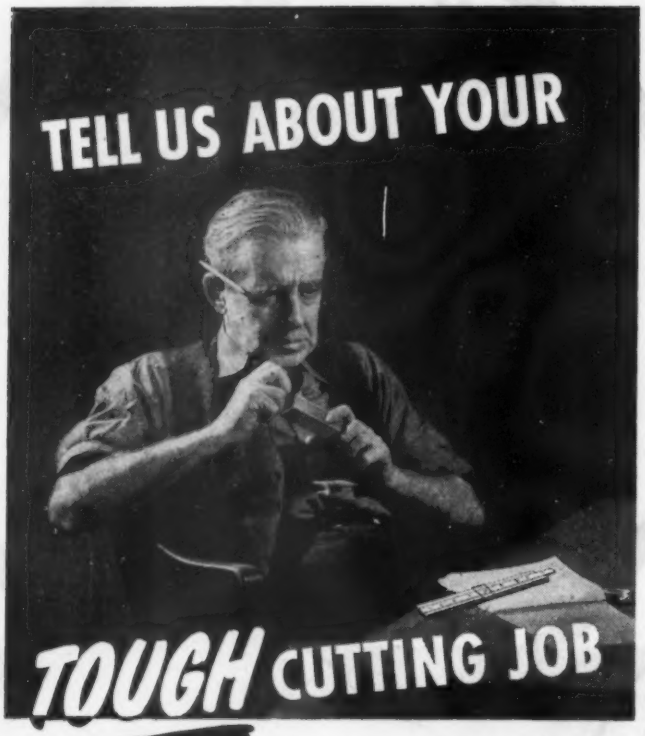
nherently accurate in that they elimi- human and mechanical errors... ys grinding correctly formed points identical angles and length of lips. killed labor quickly learns to pro- free cutting accurate drills that operate at the most efficient speeds with increased number of holes per grind—holes that require no "doctoring"... Write today for complete data on these modern production tools.

WM. SELLERS & COMPANY
1610 HAMILTON STREET
PHILADELPHIA, PA.

TYPE 1-G MOUNTED ON TOOL CABINET . . . CAPACITY FROM .028" TO ½" DIA.

SELLERS

Precision Tools Since 1848



● On many kinds of jobs, **CAMPBELL ABRASIVE CUTTING MACHINES** are speeding production and cutting costs. But abrasive cutting shows up best on unusual — really tough — cutting operations.

Instead of our describing the complete range of **CAMPBELL ABRASIVE CUTTING MACHINES**, we would rather have you tell us your specific problem. If it is difficult, perhaps we can simplify it. If it is simple, we may help you to speed up and economize production.

WHY NOT DO THIS?

Write and tell us (1) the range of sizes, (2) kind of material, (3) length of cutoff pieces, (4) length of stock before cutting, (5) tolerance for length of cut pieces and (6) hourly production requirement. With this information as a basis, **CAMPBELL** engineers can recommend production procedure and work up cost sheets for you.

Campbell

ABRASIVE CUTTING MACHINES

ACCO

ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

ANDREW C. CAMPBELL DIVISION
AMERICAN CHAIN & CABLE
BRIDGEPORT, CONN.

TRADE MARK

GREAVES No. 2

PLAIN or UNIVERSAL MILLING MACHINE

. . . for Speed, Accuracy, Production and Tool Room Work . . .

featuring:

Power Feeds, all Directions
Rapid Traverse—6-way
Alloy Hardened Gears
One Shot Lubrication to Tab
Saddle Slides and Screws
All Speed and Feed Chang
through Positive Gearing
All Speed and Feed Gearing
in Oil
Timken Bearings
Glass Sight Oil Control
Unit Construction
Central Control Position for
Operation Levers
Coolant System

Specifications

Table—52¼" x 12"
Feed range—Longitudinal Power Feed 28"
Cross Power Feed 10"
Vertical Power Feed 19"
Overarm—4½" diameter
Spindle—Chrome nickel steel National Standard taper hole #50
Speeds—18—Range 20-1000 RPM Reverse on all speeds
Feeds—9—Range ½" to 18" per minute
Rapid traverse — Longitudinal — cr and vertical—All directions—7 per minute
Weight—3750 lbs.

Send for illustrated literature giving complete information.
Write for nearest agent or dealer

Exclusive Distributors

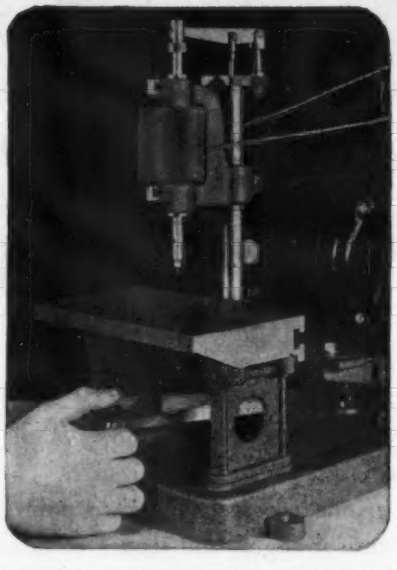
H. LEACH MACHINERY CO.
387 CHARLES STREET PROVIDENCE, R.

ASSURE ACCURACY—Reduce Drill Breakage—Increase Production

with the

Lord & Davis

Super-Sensitive HIGH-SPEED DRILL PRESS



Eight spindle speeds from 3000 to 23,000 R.P.M. are available on this machine which is made in 1, 2, 3, or 4-spindle models.

Designed for using drills from .004" to 1/16", it is of precision, balanced construction. It is unusually sensitive, thereby increasing production and minimizing drill breakage.

Convenient, finger-tip control is provided, the feed lever being linked to top of precision spindle through spindle mount. The weight of this feed mechanism is counter-balanced by a long spring inside the mount.

Maximum feed 1¼"—Table 47/8"x8"

Write today for Descriptive Bulletin, giving complete details.

MASSASOIT MACHINE CO.
220 GROVE ST., WALTHAM 54, MASS.

FIRING PIN for COLT'S PATENT FIRE ARMS MFG. CO.

. . . . a Typical Product of the Wickman No. 2

SWISS-TYPE HIGH PRECISION AUTOMATIC

✓ **MATERIAL:**
WD 1095 high-carbon steel.

✓ **OPERATIONS:**
Turn 6 diameters, .072" to .285" —5 fillets—3 chamfers (one with radius)—and 3 tapers, including taper 1-1/16" long.

This firing pin (shown actual size) is a product of Colt's Patent Fire Arms Mfg. Co. of Hartford, Conn., and is produced complete in a single cycle on the No. 2 Wickman, without attachments. High spindle speed, adequate rigidity and the use of tungsten carbide tools permits good production in the tough steel used, and the work is easily held to the required close tolerances.

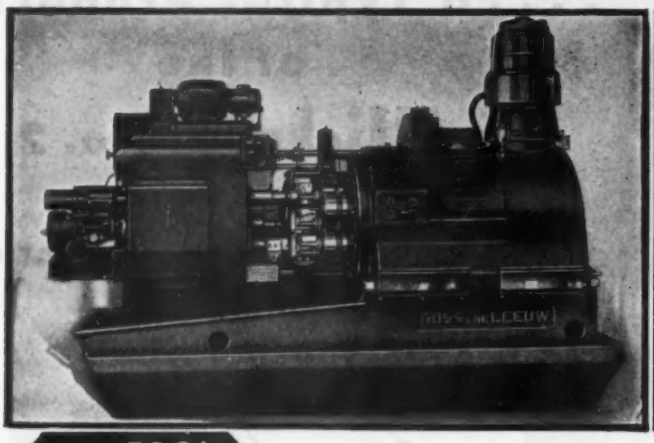
Wickman Automatics employ the proven Swiss principle of synchronized advance of the bar stock past five radially-operated single-point tools. Thus pivot points and tapers of any angle, multiple diameters, back shoulders, recesses and irregular contours all can be turned in a single machine cycle. The work is supported at all times by a guide bushing just a few thousandths from the tools, permitting high finish and extreme accuracy on long, slender work. Attachments provide for drilling, reaming, threading, tapping, slotting, etc., simultaneously with the machine operations.

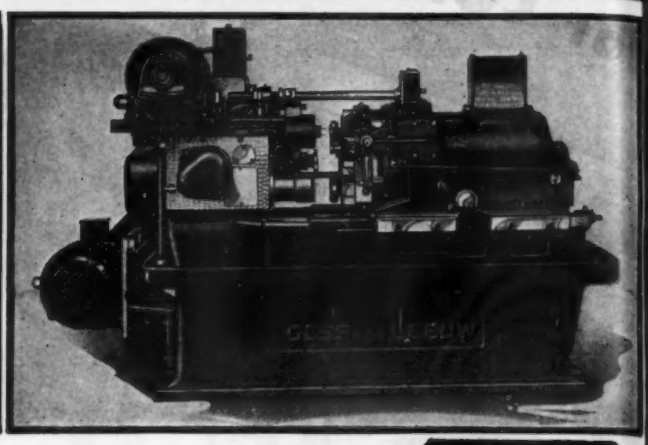
CAPACITIES: WICKMAN NO. 2 (Illustrated)—1/2" . . . WICKMAN NO. 1—5/32"

THE Wickman CORPORATION
15539 WOODROW WILSON AVE., DETROIT 3, MICH.
A. C. Wickman (Canada), Ltd., P. O. Box 9, Station N, Toronto, Ontario

Branch Offices: 1060 Broad St., Newark 2, N. J. • National City Bank Bldg., Cleveland 14, Ohio • Civic Opera Bldg., Chicago 6, Ill.

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES





TOOL ROTATING TYPE
4 Spindles
5 Chucking Positions

Features include:

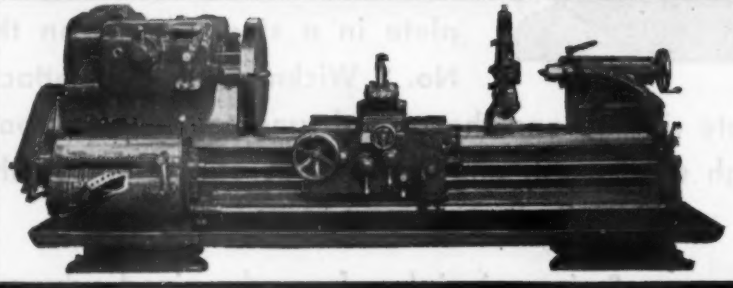
Lead Screw Threading on both types—Preloaded Anti Friction Spindle Bearings—Hardened Ways—Oversize Spindles—Gears of Chrome-nickel steel, carefully heat-treated.

Write for copy of descriptive catalog giving complete, detailed specifications.

WORK ROTATING TYPE
5 Spindles
6 Spindles
8 Spindles

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

SPRINGFIELD GEARED HEAD LATHES



for peacetime or war production!

A lathe purchased now, for round-the-clock war production, must still meet peacetime requirements. Therefore, specify SPRINGFIELD lathes—flexible, efficient, ideal for emergency or normal production. SPRINGFIELD lathes are built in sizes from 14" to 30". Write for descriptive bulletins, prices, deliveries, etc.

The SPRINGFIELD MACHINE TOOL COMPANY • • • SPRINGFIELD, OHIO, U.S.A.

CARLTON RADIAL DRILL

"Anti-friction Bearings Throughout"

FEATURES— 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The CARLTON MACHINE TOOL COMPANY
CINCINNATI, OHIO, U. S. A.

ARMY E NAVY

TO THE *GEAR USERS* OF AMERICA

Little enough credit has been given the GEAR MAKERS of America for their outstanding contribution to the Gear Industry. Without the consistent, refined accuracy in todays gear construction, "pin-point bombing", "maneuverability", "rapid acceleration", and other overworked trade expressions would still be words instead of actualities.

Achieving this consistent precision requires a constant vigilance over production operations and many leading gear manufacturers have designated Vinco Dual Purpose Gear Rolling Inspection Fixtures—coordinated with Vinco Master Gears, as an essential to successful inspection control. The dual purpose fixture, as the name implies, has the important advantage of checking both the run-out and backlash of the part gear with one Vinco master gear; a Vinco feature that saves time, cuts operating costs and increases production. For a more detailed description write for BULLETIN NO. 91.

MILLIONTHS OF AN INCH FOR SALE BY VINCO

REG. U. S. PAT. OFF.

VINCO CORPORATION, 8851 SCHAEFER HIGHWAY, DETROIT 27, MICHIGAN; SALES OFFICES, NEW YORK, CHICAGO, CLEVELAND

Semi-Automatic Hydraulic Spline and Gear Grinder • Optical Master Inspection Dividing Head • Involute Checker • Angle Tangent to Radius Dresser • Index Plates • Precision Vises • Sine Bars • Straight-side Spline, Serration Spline, Involute Spline and Helical Spline Plug and Ring Gages • Thread Plugs, Rings and Setting Plug Gages • Spur and Helical Master Gears • Munition Gages • Propeller Hub Gages • Built-up and Special Gages • Gear Rolling Fixtures • Spline and Index Fixtures • Hydraulic Power, Control, Utilization and Distribution Units • Engineering, Design and Development.

MOREY TURRET LATHES
for BAR or CHUCKING { UNIVERSAL or PLAIN

3 UNIVERSAL

For bar stock up to 1½" in diameter
10" turning length
16½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A

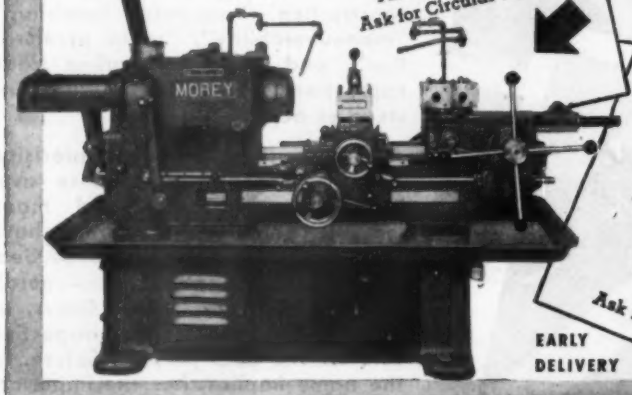
2 PLAIN-GEARED

For bar stock up to 1" in diameter
Turning length 6½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
Ask for Circular 629A

4 UNIVERSAL

For bar stock up to 2" in diameter
12" turning length
19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 738A

EARLY DELIVERY



- INFINITE SPINDLE SPEEDS —Electrically Selected—
- DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (pulleys supplied loose).
- GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES. SPINDLE MOUNTED ON TIMKEN BEARINGS.
- RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS MODERN TOOLS WILL WITHSTAND.
- SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.

ARMY E NAVY

- THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

DESIGNED AND BUILT BY
MOREY MACHINERY CO., INC
410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK

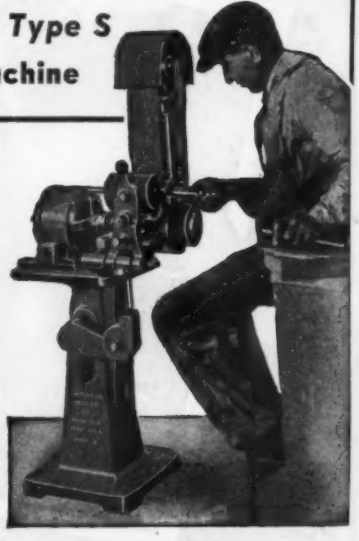
PORTAGE

HORIZONTAL BORING, DRILLING AND MILLING MACHINE NO. 4

• Featuring an extended saddle and table with outer rail support for maintaining exceptional accuracy on long work. Get fully acquainted with the many features of this modern Boring Mill. *Ask for a copy* of our new instructive bulletin which points out the numerous advantages of this new Horizontal Boring, Drilling & Milling Machine.

THE PORTAGE MACHINE CO.
AKRON 11, OHIO

Anything that can be ground or polished can be FINISHED on the
"PRODUCTION" *Type S* Centerless Machine



Ideal for cylindrical or flat work this machine offers the following features:

- . . . patent centerless feed for cylindrical work—no centering or chucking—work is fed automatically
- . . . feed mechanism quickly swung out of way when not needed
- . . . quick change from vertical to horizontal
- . . . adjustable gauge for bevels
- . . . tracking device for quickly tracking belt
- . . . automatic take-up for belt stretch
- . . . ball bearing equipped
- . . . direct motor drive

Illustrated bulletin, available on request, gives full information.

SPECIFICATIONS
Capacity of Centerless Feed—¼" to 1" diam.
Abrasive Belt—4" wide x 60" long, endless
Motor 1 H.P.—1750 R.P.M.
Belt Speed—3200" per min.
Table—4½" wide x 13½" long
Table to floor (horizontal position) 36".

PRODUCTION MACHINE CO.
Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.
GREENFIELD, MASS., U. S. A.

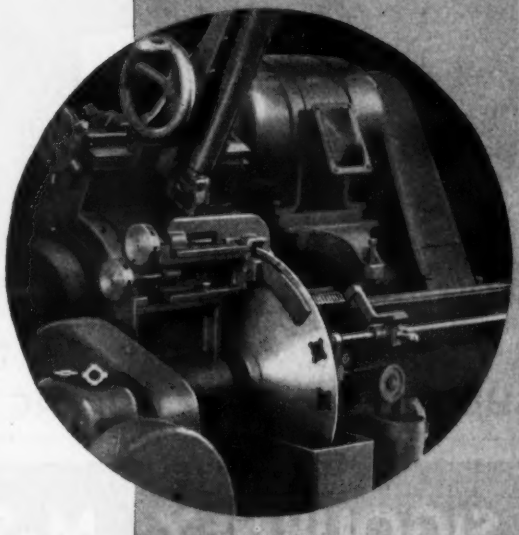
GROUND *in 2 seconds* — and that's only ONE of *dozens* of PARALLEL-SURFACE jobs *adapted to* GARDNER *Double* GRINDING

HERE'S another example of high-production and close accuracies obtained through GARDNER DOUBLE-GRINDING.

The moulded graphite washers shown here, are ground semi-automatically on a Gardner No. 114-20" machine, using a rotary-type work carrier loaded by hand, and automatically unloaded. Machines of this type, in all branches of industry, are turning in production records like the one printed below — it's becoming a common, everyday occurrence.

Did we say-"GROUND IN 2 SECONDS"? It's even BETTER than that—it's 30 TO 40 PIECES PER MINUTE!

Let's look at the record—



THE FULL PRODUCTION STORY:

PART: Moulded graphite washer, 1⅝" dia. x 11/16" hole x ⅛" thick.

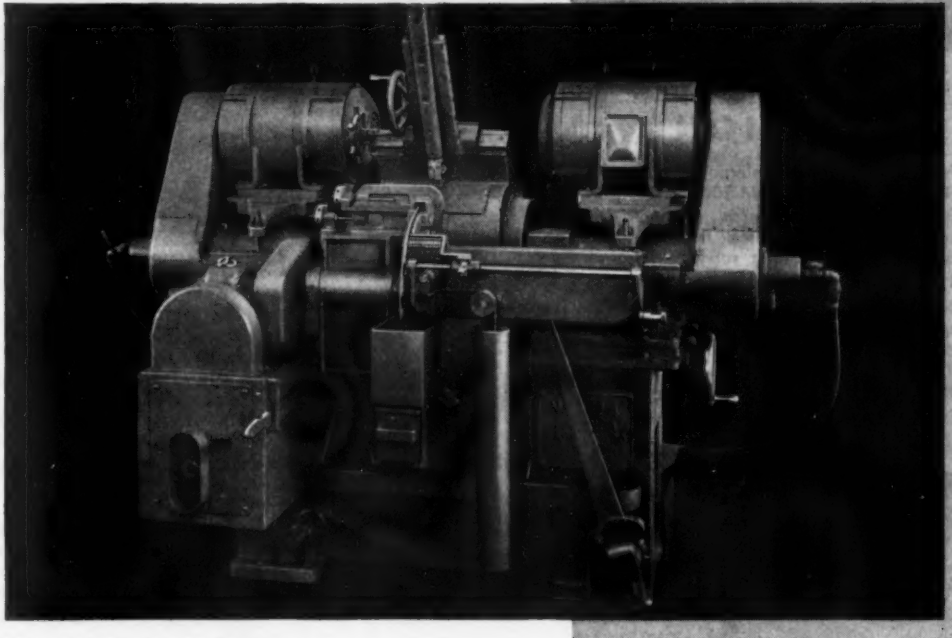
REQUIREMENTS: Grind 2 parallel sides.

STOCK REMOVAL: .030" maximum, overall.

TOLERANCES: Within .0005" for parallelism, and .002" to .003" for size, or uniformity.

PRODUCTION: 30 to 40 pieces PER MINUTE!

Write for our DOUBLE-GRINDING BULLETINS!



ARMY E NAVY

GARDNER MACHINE COMPANY

410 East Gardner Street , , , , Beloit, Wisconsin, U.S.A.

If it's a small part, turn it with Precision, Speed and Profit on a

SHELDON LATHE

Model 5-36
10" Precision Lathe

All SHELDON lead screws are cut on the finest Pratt and Whitney "Super-precision" lead screw machine

BUILDERS of GOOD LATHES since 1919

Engineered for precision shop and tool room work. Rigidly built to stand up and hold its close accuracy under round-the-clock operation. This is a quality machine tool in every detail, yet is moderate in price . . . a lathe that stands out far ahead of others. (The lathe selected by U.S. Army, the Navy and the Marine Corps, for mechanized machine shops, instrument repair shops, etc.)

Contact us or your local Sheldon dealer for prices, engineering data, deliveries, etc.

- Heavy Bronze bearings
- 1" Collet capacity
- 11¼-inch swing
- Double-walled apron
- Large hardened and ground spindle
- Extreme accuracy
- Convenient controls
- Underneath V-belt motor drive
- All Steel Bench

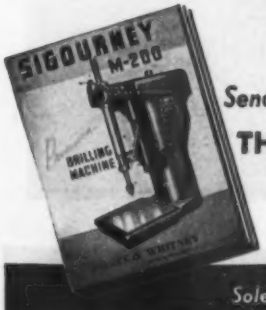
SHELDON MACHINE CO., INC., 4234 N. KNOX AVE., CHICAGO 41, U. S. A.

SIGOURNEY M-200

FOR UTMOST PRECISION

For drilling where tolerances are close, the Sigourney M-200 Bench Drilling Machine affords extreme accuracy and maintains this accuracy through a long service life.

This new machine is available in 1, 2, 3 and 4 spindle models . . . drills up to ½" diameter . . . variable speed drive gives all spindle speeds from 700 to 4000 R.P.M. . . . No. 1 Morse Taper.



Send for illustrated bulletin

THE SIGOURNEY TOOL CO.
Hartford 6, Conn.

Sole Sales Agents

PRATT & WHITNEY
Division Niles - Bement - Pond Co. - - - West Hartford, Connecticut

---

The SUPER METHOD

of TRIMMING FORMED PARTS

and performing a host of other metal cutting jobs!

The negligible down-drag and the ability of Tannewitz High Speed Band Saws to cut sheet metal from 90° to near 0 or 135° at tremendous speed make these machines ideal for trimming. Cuts can be made with perfect safety without using a rest of any kind. Friction sawing with Tannewitz High Speed Band Saws also results in perfectly amazing time savings in the cutting of flat sheets, soft or hardened steels, armor plate, plastics, glass and many other materials. Whatever your cutting problem, chances are it can be done better and faster with Tannewitz Band Saws. Investigate this "Super" method of cutting.

Write for Your Free Copy

FRICTION SAWING *with* Tannewitz
HIGH SPEED BAND SAWS

THE TANNEWITZ WORKS GRAND RAPIDS 4, MICHIGAN

First FOR EXTERNAL THREADING . . .
THREAD SPECIFICATION
2 11 16 — 32NS — THD.
MAJOR 2.6875 — 0054
PITCH 2.6672 — 0054
MINOR 2.6492 MAX.
PLAN-O-MILL
with Exclusive Offset Head

THREE definite advantages are yours when you use Plan-O-Mill's exclusive Offset Head for external thread milling.

1. Lower cutter cost.
2. Longer cutter life.
3. Better cutting control.

With Plan-O-Mill's exclusive Offset Head you can use a small, solid, low-cost cutter to mill external threads over 1½" in diameter. Shown above is a typical application.

Plan-O-Mill is a high production machine for internal and external threading and form milling. It is fast, accurate and economical, producing work of exceptional finish. General Electric Thy-motrol gives separate and complete control of feed-in and feed-around—enables one operator to handle two or more machines.

For war or postwar production, turn now to Plan-O-Milling. Ask your machinery dealer for details or write direct.

Five Firsts

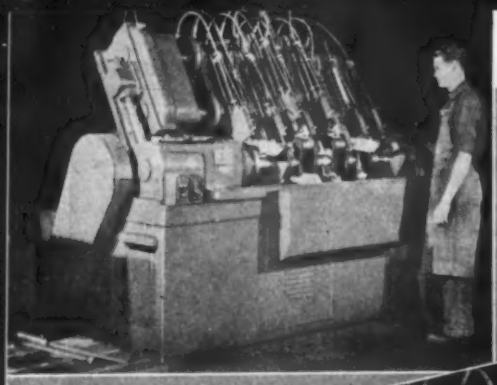
1. First to install General Electric's remarkable new Thy-mo-trol electric feed control!
2. First planetary to mill external threads with standard multiple thread cutter!
3. First planetary to coordinate feeds and speeds!
4. First to provide absolute control of feed-in!
5. First to offer a practical, low cost carbide thread milling cutter!

THREAD AND FORM PLAN-O-MILL MILLING MACHINES

PLAN-O-MILL CORPORATION

1511 E. EIGHT MILE ROAD • HAZEL PARK, MICHIGAN

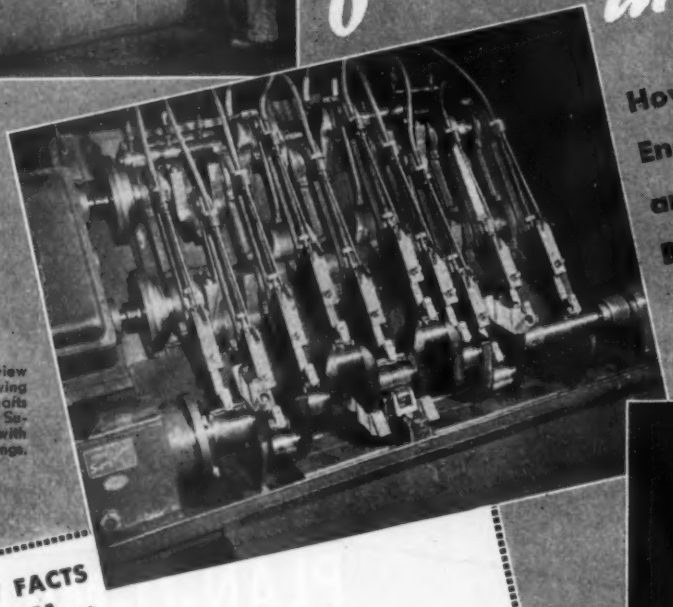
THREAD AND FORM PLAN-CO MILLING CUTTERS



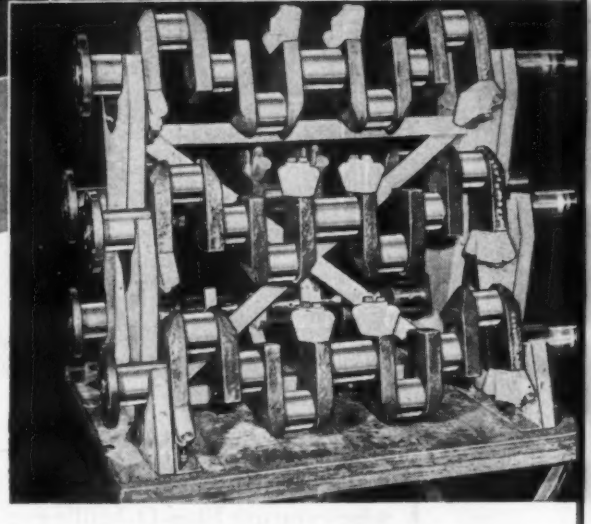
SUPERFINISHING DIESEL CRANKSHAFTS *from 20 to 2½ micro inches in three minutes!*

How This Manufacturer Reduces Engine Wear, Vibration, Friction and Oil Loss by Superfinishing Bearing and Oil Seal Surfaces

(Above) Foster No. 60 Superfinisher



(Right) Close-up view of Superfinisher showing two master crankshafts which synchronize Superfinishing heads with their respective bearings.



(Below) Rack of Diesel Engine Crankshafts after Superfinishing. Note mirror-like finish produced.

IMPORTANT FACTS AND JOB DATA...

PART—Diesel Engine Crankshaft.
MATERIAL—Steel Forging 3.6-3.9 Brinell, 60-70 Rockwell.
MACHINE—Foster Superfinisher No. 60.
BEARING SIZES—Connecting rod 3.624" dia., 3½" length. Main Bearing 3.749" dia., 3" length.
STOCK REMOVED—.0004"-.0005".
PROFILOMETER READINGS—Before Superfinishing, 20 micro inches. After Superfinishing, 2¼ to 3½ micro inches.
TOTAL CYCLE TIME—3 minutes.
LOADING—CHECKING—UNLOADING—3 to 4 minutes.
FLOOR-TO-FLOOR TIME—6 to 7 minutes.

● All main and connecting rod bearings and oil seal surfaces of this 4-cylinder Diesel engine crankshaft are superfinished to 2½ micro-inches with .0004" to .0005" stock removal in 3 minutes per shaft. The crankshafts come to the Foster Superfinishing machine with bearing surfaces ground to approximately 20 micro-inches.

Ten Superfinishing heads, operating in an automatic cycle, superfinish all bearing and oil seal surfaces simultaneously. Two master crankshafts are used to synchronize the movement of the Superfinishing heads on their respective surfaces which increases the overall accuracy of the Superfinishing operation.

How Superfinishing Improves Surface Finish

Grinder feed spirals, grinder flats and other marring defects caused by grinding inaccuracies are eliminated by Superfinishing. Loosened metal particles, which adhere to the surface of the work after turning and grinding operations, are removed. Superfinishing also eliminates ridges caused by the point of a turning tool.

What Superfinishing Does to Extend Product Life

Engine run-in periods are no longer necessary to improve bearing surfaces. Superfinishing eliminates frictional heat and frictional drag. Improved bearing surfaces add greatly to bearing life, and vibration is eliminated because of superior finish and improved bearing fitting. Sharp ridges left by grinding are removed with the result that oil films remain unbroken over the entire bearing surface.

Superfinishing Has Many Applications

To those manufacturers who wish to improve their products, Superfinishing offers a highly desirable and practical means for improving surface finishes on a wide variety of parts. Foster engineers will gladly study your surface finishing problems and make recommendations on the type Superfinisher best suited to your needs. There is no obligation for this service.

Valuable Superfinishing Data Book FREE!

The Superfinishing process is explained in detail in this book. Actual case histories show the many uses and advantages of Superfinishing. Foster Superfinishing Machines are illustrated and described. Write to Foster Division, International Detrola Corp., 1100 West Beardsley Avenue, Elkhart, Indiana, now for your *free* copy.

INTERNATIONAL MACHINE TOOLS

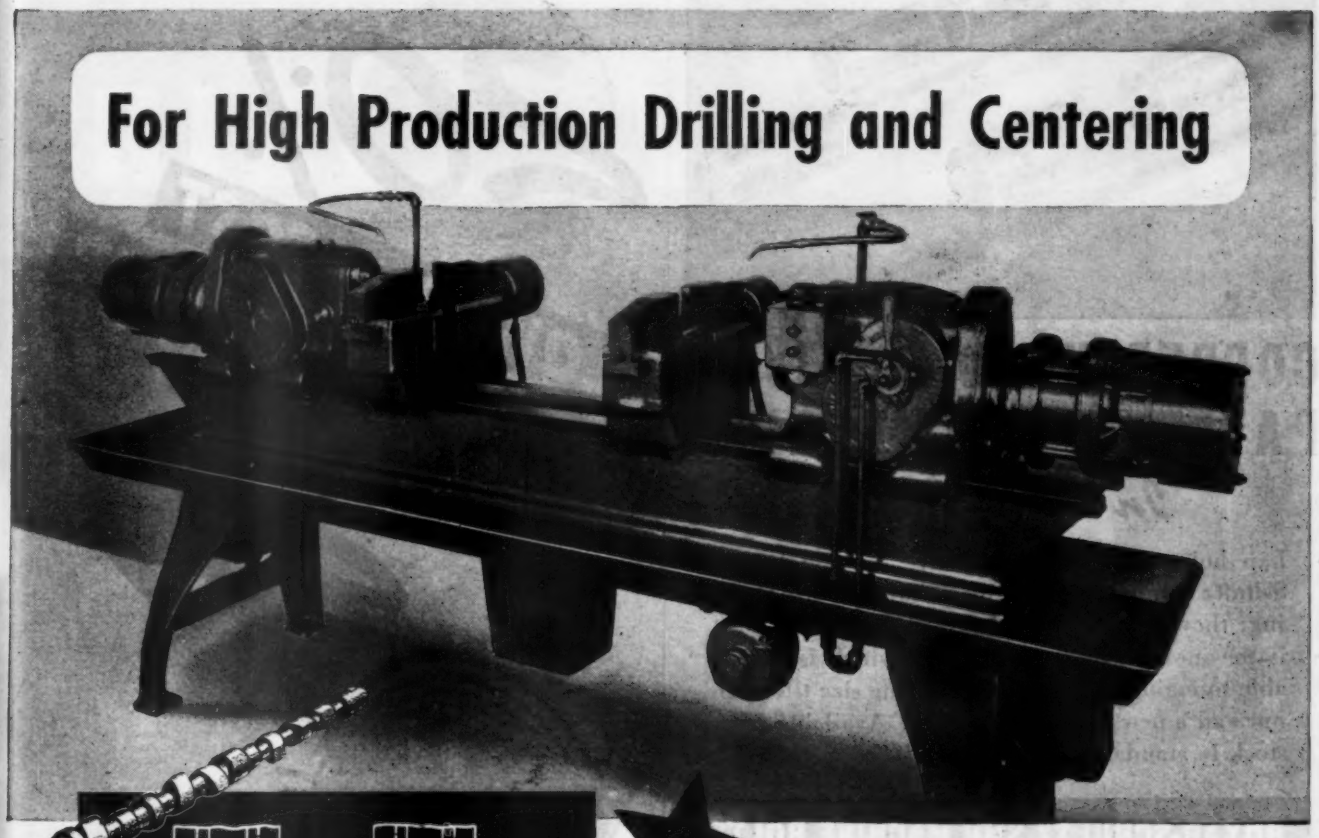
Foster Division - Elkhart, Indiana

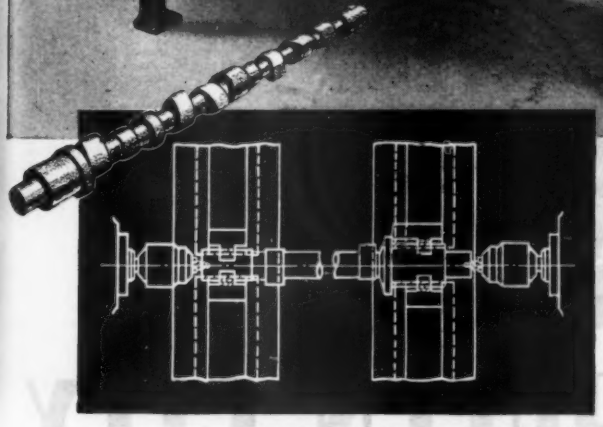
INTERNATIONAL DETROLA CORPORATION

DETROIT, MICHIGAN • ELKHART, INDIANA • INDIANAPOLIS, INDIANA

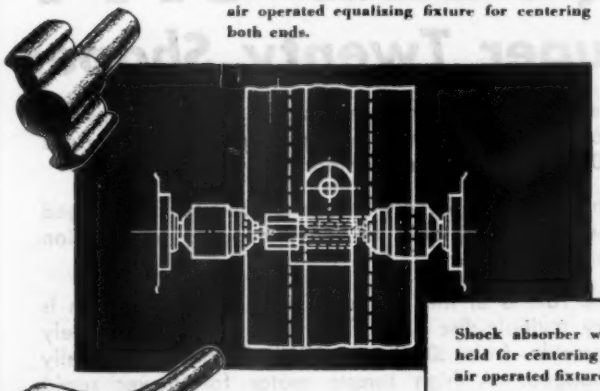
FOSTER FASTERMATICS • LIBBY HEAVY DUTY TURRET LATHES • STANDARD TOOLS • SUPERFINISHING MACHINES • SPECIAL MACHINE TOOL

For High Production Drilling and Centering

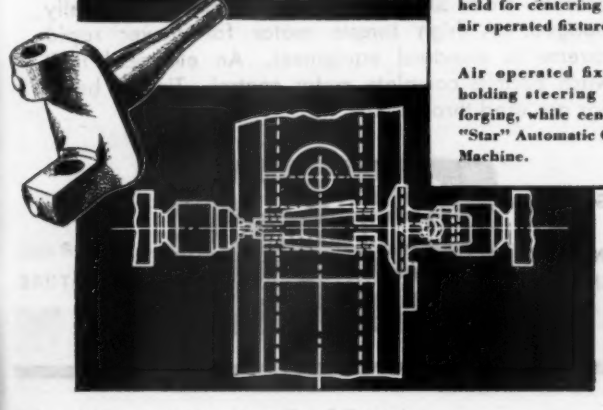




Conventional type of motor cam shaft showing air operated equalizing fixture for centering both ends.



Shock absorber wing shaft held for centering in single air operated fixture.



Air operated fixture for holding steering knuckle forging, while centering on "Star" Automatic Centering Machine.

STAR AUTOMATIC DRILLING AND CENTERING MACHINE

● The Star Drilling and Centering Machine provides a better method of centering work on a production basis, yet it is flexible enough to permit economical change-over when necessary.

Two motor-driven independent "heads" each with its own closed cycle and independent speeds and feeds are arranged to operate in timed relation to each other. The heads are built for high speed and long life. Each head is provided with a hardened steel barrel cam which imparts the feeding movement to the spindle and makes it possible to vary the "feed" stroke to suit individual operations. Cams may be easily changed to meet varying conditions. The distance from bed to spindle is ample to provide sufficient room for special work holding fixtures, should they be necessary. Standard quick-acting, equalizing vises are available and may be arranged to operate singly or in pairs.

The standard cycle provides rapid approach, feed, withdrawal near end of feed stroke (to clear chips) and a slow final feed insuring a smooth accurate center hole. Other variations of this cycle are possible so that one end of a shaft may be drilled, centered, and counterbored while the other end is being centered.

We welcome your inquiries. Our engineering department is at your service.

SENECA FALLS MACHINE CO.

Seneca Falls **New York**

COPPER HEAD LAPS PAY FOR THEMSELVES

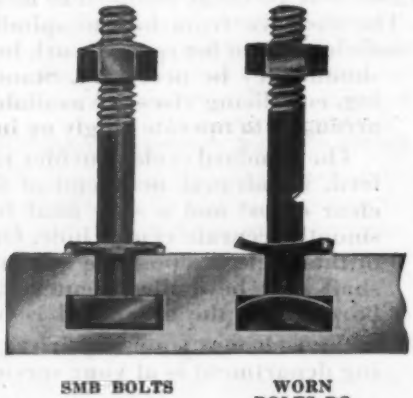
In Time Saved

Lap holes the economical way . . . use Boyar-Schultz Copper Head Laps. They are fast working; they never wear out. The only wearing part is the inexpensive copper sleeve which is adjustable to maintain the correct lapping size till worn out and a new one is substituted. Available from stock in standard sizes, ⅛" to 2½".

BOYAR-SCHULTZ SMB MACHINE BOLTS
SAVE the Machine . . . SAVE the Job . . .
SAVE Time

Worn and distorted Bolts like the one shown below at the right, can damage the accuracy of machine beds making costly repairs necessary.

Boyar-Schultz SMB Bolts are made from heat treated alloy steel for strength and toughness. Heads are machined square with bodies, presenting a clean flat surface to the T-slot. Threads are carefully cut. Close adjustments is possible and work is held firmly under heavy machine cuts. SMB Nuts and Washers are specially made for use with SMB Bolts.



SMB BOLTS FIT SQUARELY

WORN BOLTS DO NOT HOLD FIRMLY

BOYAR-SCHULTZ CORPORATION
2109 WALNUT STREET CHICAGO 12, ILL.

20% LOWER in COST The NEW SUPERIOR 20"

QUEEN CITY

Super Twenty Shaper

Here is a Shaper, new in design, superior in construction, with many improved operating features—priced 20% lower than any comparative models.

The 20" Super Twenty Shaper is powerful and rugged —equally adaptable to heavy hogging or precision tool room work.

The ram is of the V-type of wide bearing. Clutch is dry multiple-disc type. The feed range is extremely versatile—from .008" to .191", quickly and easily changed. A high torque motor for power rapid traverse is standard equipment. An electrical limit switch permits complete motor control. Timken bearings are used throughout.

AGENTS IN PRINCIPAL CITIES

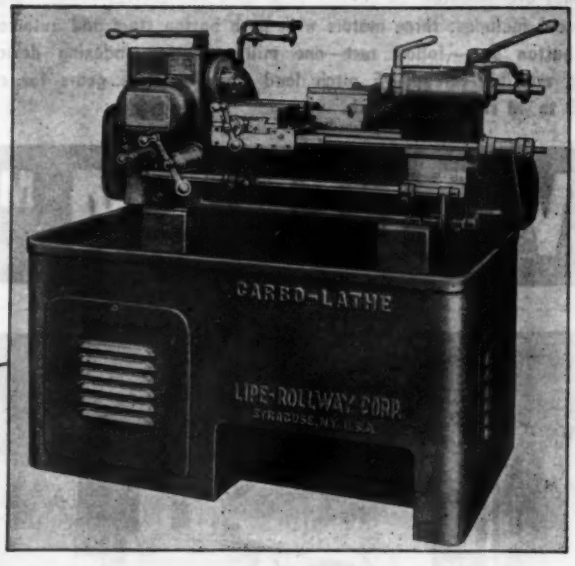
QUEEN CITY MACHINE TOOL Co.
217 E. SECOND ST.
CINCINNATI 2, OHIO

WRITE FOR LITERATURE

RIGIDITY, POWER *Speed* FOR FASTER TURNING AND MULTIPLE-TOOL ECONOMY . . .

LIPE CARBO Semi-Automatic

America's Pioneer Carbide-Tool LATHE



Short of base! Low center of gravity! A bed and headstock cast in one piece from 500 pounds of chrome-molybdenum-iron! That's why the Lipe Carbo Lathe eliminates all deflection and head weaving. A massive tailstock, with a 3" diameter quill . . . and heavy bed sidewalls reinforced by cross ribs . . . give further resistance to torsional stresses and strains.

Swing over bed	14"
Swing over cross slide (regular carriage)	7"
Between centers	18"
Low gear spindle speed	95 to 1130 RPM
High gear spindle speed	167 to 1978 RPM
Low gear head feeds	.005" to .030"
High gear head feeds	.003" to .025"

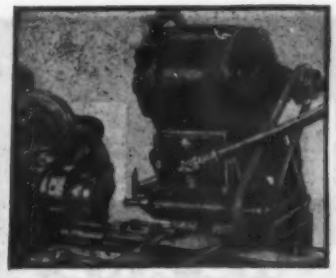
Rigidity . . . plus brute power and a wide range of selective speeds . . . that permit hogging feeds and cuts, as well as multiple-tool economy, on high Brinell steels, scaly surfaces, sand holes, weld spots and jump cuts. All with reduced tool wear and tool breakage because this—America's first carbide-tool lathe—is designed to give the full advantage of carbide-tool speed, particularly on big lot-sizes and continuous production runs. More—two carriages can be used at one time—one front and one rear—for simultaneous rough and finish turning, simultaneous straight and taper turning, or simultaneous straight and angular facing.

ARMY E NAVY

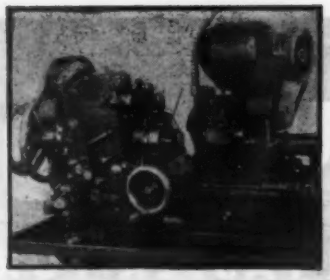
Write for complete data and delivery dates

LIPE-ROLLWAY CORPORATION

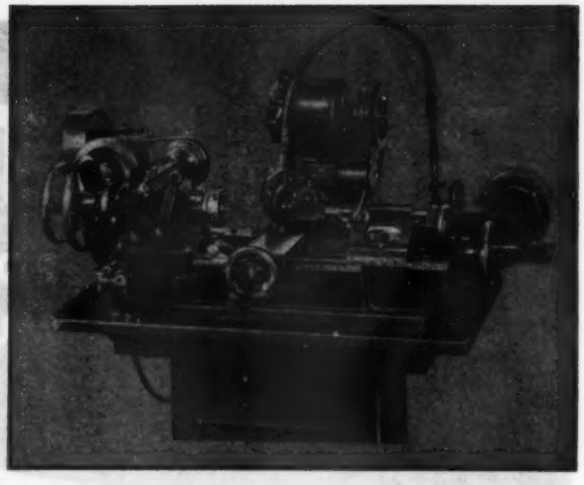
SYRACUSE 1, NEW YORK



Machine equipped with Internal Milling Attachment



Machine equipped with Relieving Head



ALL STANDARD FORMS OF THREADS CAN BE PRODUCED TO CLOSEST TOLERANCES ON

WALTHAM THREAD MILLERS

Three motors on these machines provide a wide flexibility in operation as well as a constant supply of coolant for all requirements. By simply changing ratios, speeds are suitable for cutting either brass or steel. Waltham can furnish cutters for any thread form desired.

Machines are mounted on cabinet base with two shelves inside. Standard equipment includes: three motors with push button start and automatic or push button stop—follow rest—one milling cutter—indexing device for cutting multiple threads—5 pitch lead screw—change gears for cutting from 5 to 40 threads per inch.

Special Equipment Extends Utility

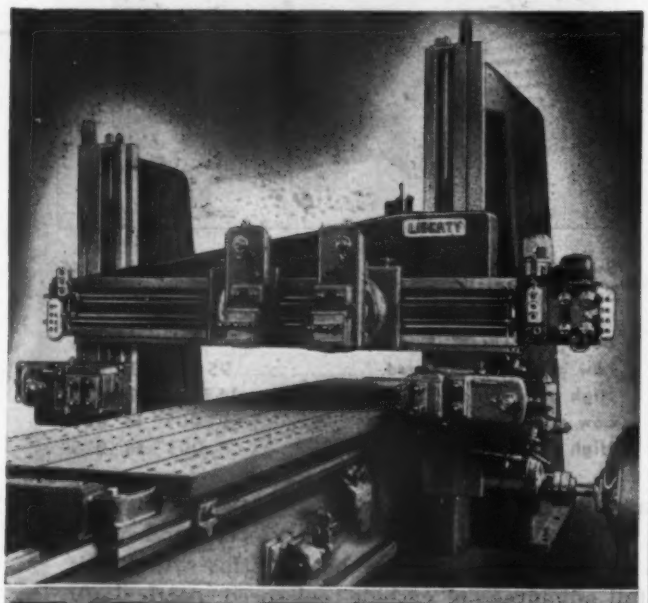
Extra equipment includes: a special work head for relieving—a special motor driven cutter head for internal threading—a multiple cutter threading attachment—automatic cam operation—special tailstock for multiple cutter work—translating gears for cutting metric threads—metric lead screw—plain taper attachment.

Write for Bulletin 244A giving detailed information.

WALTHAM MACHINE WORKS

WALTHAM, MASS.

WALTHAM TRADE MARK REGISTERED U.S. PAT. OFF.



LIBERTY

SMALL, MEDIUM AND HEAVY DUTY

PLANERS

FOR HIGH SPEED, LOW COST PRODUCTION

LIBERTY PLANERS • HAMILTON, OHIO, U. S. A.

Over a Quarter Century of Specialized Experience with Time Tested Principles of Design

---

LUCAS "PRECISION"

Horizontal Boring, Drilling and Milling Machine

THE LUCAS MACHINE TOOL CO.

NOW AND ALWAYS OF

CLEVELAND
OHIO, U. S. A.

KNIGHT VERSATILE MILLERS ACCURATE RIGID

FOR FURTHER DETAILS SEE FULL PAGE AD IN PREVIOUS ISSUE

W. B. KNIGHT MACHINERY CO.

ST. LOUIS MISSOURI

UNIVERSAL *Horizontal Boring Machine*

The only TRIWAY *Boring Machine Built*

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.

Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.

Hudson, Mass., U. S. A.

Increase engine lathe efficiency with

LOVEJOY TURRET TOOL POSTS

With Lovejoy turret tool posts, you can increase the multiple-tooling on any engine lathe; you can take maximum cuts; you can increase production without increasing operator fatigue.

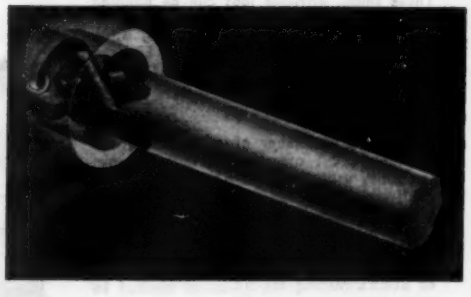
The operator, by one movement of the binding lever, releases, accurately indexes, and binds the turret. Interchangeable turret rings permit the use of additional rings, carrying a variety of tool combinations for various jobs, without disturbing cutter adjustments.

Lovejoy single point tools and boring bars employ the famous Lovejoy positive-locking blades for smooth cutting and fine finish. This feature means that the locking device does not protrude from the boring bar, and intermittent heavy cuts will not loosen the blade.

Lovejoy tool posts, with Lovejoy single point tools and Lovejoy boring bars, make an ideal cost-saving, time-saving combination. Any of the cutting tools can be furnished in HSS, tungsten carbide or cast alloy.

The new Lovejoy Tool Catalog describes these tools as well as the complete line of Lovejoy milling cutters—write for your free copy today!

...AND LOVEJOY POSITIVE LOCKING SINGLE POINT TOOLS AND BORING BARS

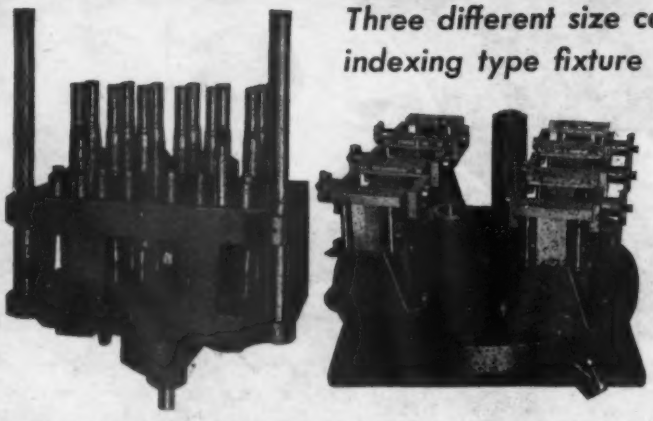


Lovejoy

TOOL COMPANY, Inc., SPRINGFIELD, VT., U.S.A.

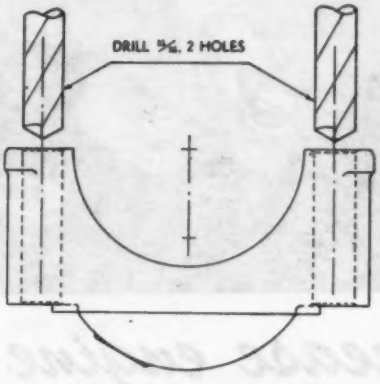
MILLING CUTTERS | BORING HEADS | ARBORS | SPOT FACING TOOLS | COUNTERBORES | BORING BARS | SINGLE POINT TOOLS | TURRET TOOL POSTS

12 Holes Drilled in SIX CONNECTING ROD CAPS in 69 seconds · · · ·



Three different size caps handled in two-station indexing type fixture

Alloy Grey Iron Casting. 11/16" drills; feed 50' per minute; .009" penetration per revolution at 278 r. p. m.; depth of cut 2⅞". This job is an example of what can be done in faster, lower cost production with Hoefer Multiple Spindle Heads. Your requirements can as easily be developed by our engineers. Write and tell us about your job.



• Twelve-Spindle Head and Fixture. Head is of Universal Joint Adjustable Type, arranged for Locator Plate (not shown) for rapid setting of spindles to any required hole layout within range of head. Fixture is of two-station Indexing Type containing two sets of Work Holding Units, each set accommodating six Connecting Rod Caps (three different sizes). Six Caps are being drilled simultaneously while six Work Holding Units are being unloaded and loaded with new parts.

HOEFER'S WHOLE BUSINESS IS HOLES

Hoefer's Whole Business is Holes · · · ·

HOEFER MFG. CO. *Freeport, Ill.*

BURKE MILLING MACHINES

. . . Put Your Small Work on a Production Basis!

Those small, difficult jobs can be handled on a *production basis* with BURKE Motor Driven Milling Machines Nos. 1, 2, 3, & 4. Primarily, this is because BURKES have been *specially designed and built* to do smaller milling jobs efficiently and economically.

Then, too, a number of attachments are available . . . attachments that increase the units usability, and add to your productivity. These include a vertical milling attachment, index centers, and vises—3 types, including swivel base. Now, when production must be stepped up, is the time to investigate the profit possibilities of BURKE Milling Machines, as applied to your work.

Complete Information Will Be Sent You Upon Request — Write!

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Giant KEYSEATERS

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

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Die-Making Machines

They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin—also circulars on Drill Grinders, Point Thinners, Tool and Cutter Grinders, Face Mill Grinders and Tool Bit Grinders.

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Automatic DRILLING - BORING MILLING - TAPPING Units

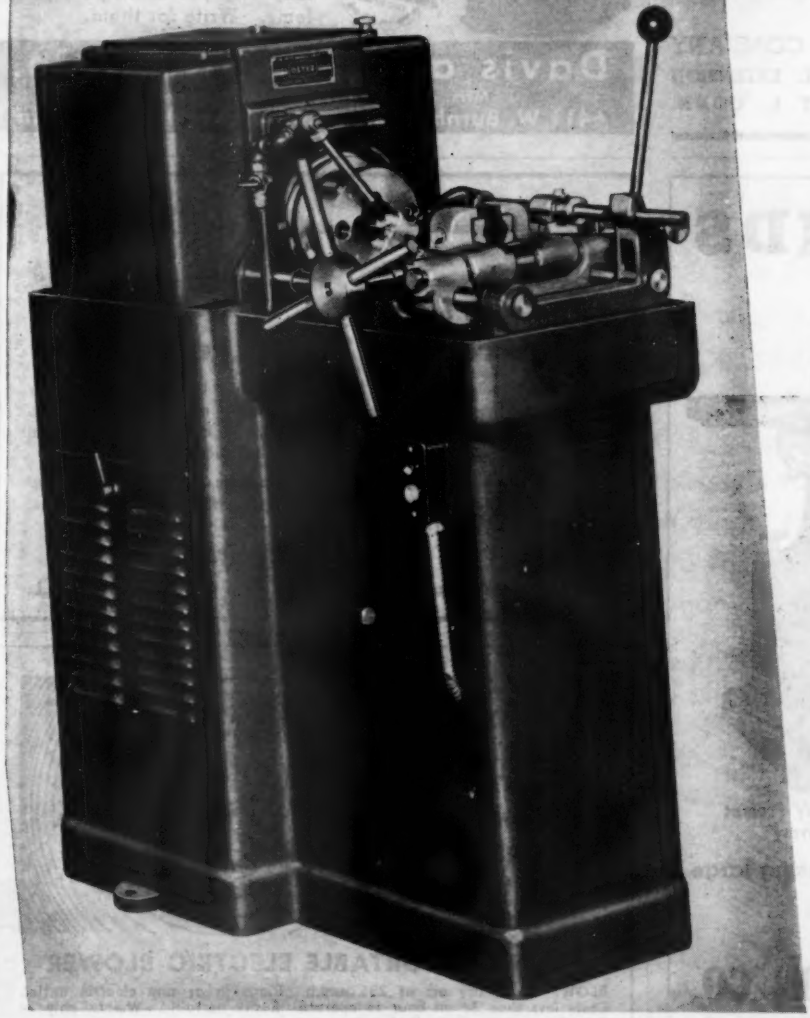
½ to 20 HORSEPOWER DRIVE

AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY

W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.

FOR SPEED ON A WIDE VARIETY OF THREADING JOBS GIVE ME THIS

OSTER "Rapiduction" JUNIOR



No. 542 "RAPIDUCTION JUNIOR" is designed with revolving die-head and open type vise to handle a wide variety of threading jobs at top speeds and low unit costs. No time lost in handling stock in and out of machine.

Production speeds on bolts, rods, studs, pipe and nipples are unusually high for this size of threading machine. (Write for production estimates on your specific work. Full description of work is requested.)

Standard range is ¼" to 1¾". Pipe or nipple range ⅛" to 1¼".

Complete information about the Oster No. 542 "RAPIDUCTION JUNIOR" Threading Machine is available from the Oster distributor in your area, or write direct to us at Cleveland, Ohio.

OSTER

THE OSTER MANUFACTURING COMPANY, 2049 EAST 61st ST., CLEVELAND 3, OHIO, U. S. A.

GET MORE FROM TOOLMAKERS' VALUABLE TIME

LINLEY design and construction were planned to help toolmakers conserve valuable time. Its features permit fast set-up for countless small machining jobs and quick changeover from one to another. The speed required is easily available . . . 8 changes from 275 to 4250 r.p.m. Everything has been done to assure smooth, rigid, accurate operation and the capacity is surprisingly large for a machine which needs but 2½ sq. ft. floor area.

For shop work which includes dies, metal patterns, models, jigs, reaming, milling and drilling, the Linley will pay its way in generous profits and in saving larger machines for their higher capacities.

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LINLEY BROTHERS COMPANY
664 STATE ST. EXTENSION
BRIDGEPORT 1, CONN.

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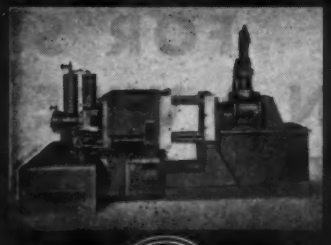

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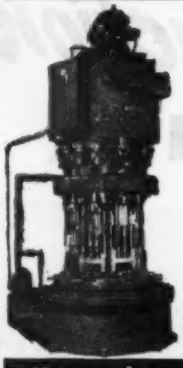
Vertical ROTO-MATICS



Multiple spindle drill heads and automatic clamping provide added production.

Continuous operation is essential for maximum production. VERTICAL ROTO-MATICS are continuous operating, multiple spindle, non-indexing machines that are adaptable to a wide range of machine problems. . . . *Bulletins 110 and 120* may help you solve your problems. Write for them.

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Mfrs. of Machine Tools and Micrometers
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GRAND RAPIDS

No. 15
Motor Driven
Surface Grinder
HAND FEED

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FOR SMALL DELICATE JOBS

6 x 18" Capacity
1½ H.P. Motor
10 x 1" Wheel

Reasonably Prompt Delivery

Many manufacturers on war work are using large batteries of these grinders.

CATALOG ON REQUEST

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GRAND RAPIDS 4 MICHIGAN

Save Hands
Speed Production
with —

LITTELL
Pres-Vac Safety Feeder

KEEP workmen's hands out of Danger Zone. Use PRES-VAC Safety Feeders to keep hands safe, improve quality and speed production. Pres-Vac acts on trigger-vacuum principle. Picks up—drops—material instantly. Uses compressed air, 10 to 45 lbs. pressure.

Littell makes a complete line of pressroom equipment, including: Reels, Roll, Dial and Magazine Feeds; Straightners; Air-Blast Valves; Scrap Wingers, etc. *Request Bulletins.*

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DUST
DIRT
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from
MOTORS *and*
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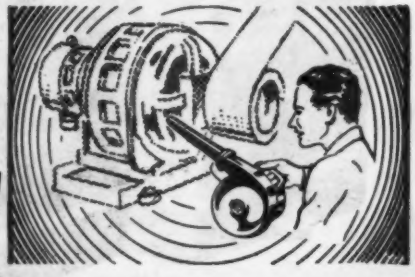
with



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BLOWS clean, dry air at 295 m.p.h. Plugs in at any electric outlet. Costs less than 3c an hour to operate. Easily portable. Weighs only 14 lbs. Cuts power cost. Prolongs equipment life.

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MORE HOLES at LESS COST

WITH Shankless*

Republic's NEW ROLL-FORGED DRILL

● Even if you paid more for them, they'd cut your drilling costs. Actually you pay less for this better, tougher, longer-lasting drill. The efficiency of this new kind of drill has been proved; hundreds of thousands of them have been used on high precision work. If you are now using taper-shank drills, it will pay you to put "Shankless" drills to the test on your own operations.

Write for YOUR FREE COPY OF REPUBLIC'S NEW MANUAL NO. S-4 WHICH TELLS A COMPLETE STORY OF THE "SHANKLESS" DRILL.

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WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF TWIST DRILLS

RUST

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TEXACO STAR THEATRE
WITH JAMES MELTON
EVERY SUNDAY NIGHT
—CBS

TEXACO

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TPROOFING

GOVERNMENT-OWNED PRODUCTION EQUIPMENT

SEE Ordnance Specification P.S. 300-4 for official instructions

USE Texaco Rustproofing Products

RECONVERSION time—when it comes to your plant—will call for prompt storage of Government-owned machines, precision tools and other production equipment. Before this equipment can be stored it must be rustproofed and processed *in accordance with official instructions.*

Ordnance Specification P.S. 300-4 gives exact specifications for rustproofing materials to be used on Government-owned equipment. Texaco rustproofing products meet Ordnance specifications. They are easily applied by brush, dip or spray, and the protective coating provided will assure preservation for years.

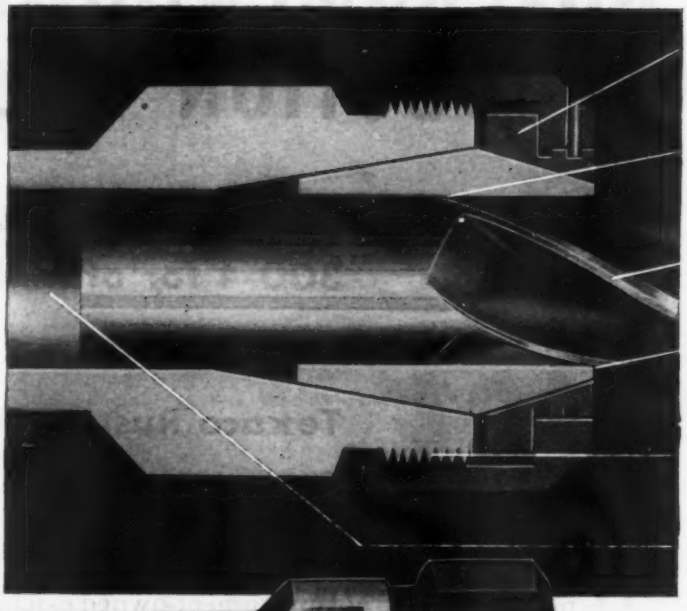
Act now to be ready for prompt reconversion rustproofing of your own as well as Government-owned production equipment when the time comes.

Whatever your rustproofing requirements, a Texaco representative can render helpful service. Get in touch with the nearest of the more than 2300 Texaco distributing plants in the 48 States, or write to The Texas Company, 135 East 42nd Street, New York 17, N. Y.

Rustproofing Products

UNIVERSAL COLLET CHUCK GRIPS TOOLS TIGHT AS A VISE

Because they grip tools tightly on a continuous surface instead of at only a few points or lines of contact, Universal Collet Chucks reduce wear and breakage of drills, end mills, taps, keyway cutters, etc., to a minimum. Their positive gripping power permits greater feeds and speeds over long periods, substantially increasing production. Their new type construction reduces locking effort by 50%, thus making tool changing less costly in valuable production minutes. They will hold six tons in a longitudinal direction and fifty foot pounds in a radial direction. And they grip drill flutes, permitting stubbing Write for complete information on the Universal tools illustrated here.



Nut tightens on floating sleeve, reduces locking effort 50%.

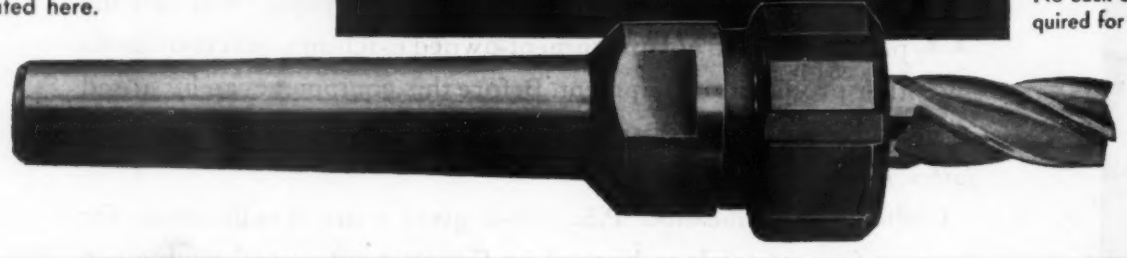
Collet grips on continuous surface — not at 3 or more points.

Grips drill flutes, permitting stubbing.

Guaranteed run out .001", one inch from chuck.

Hardened and ground threads.

No back up screw required for thrust.



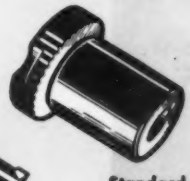
UNIVERSAL TOOLS THAT WILL INCREASE PRODUCTION AND ACCURACY IN YOUR PLANT

Index Plunger

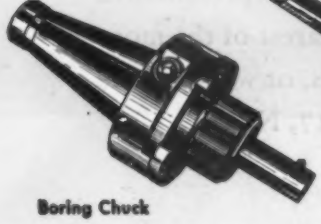
Floating Chuck

Standard Collet Chuck

Mikro-lok Boring Bar



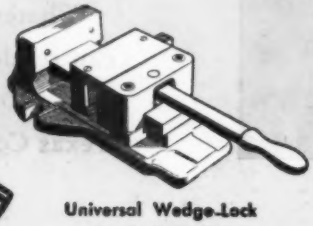
Standard Drill Bushing



Boring Chuck

Centering Chuck

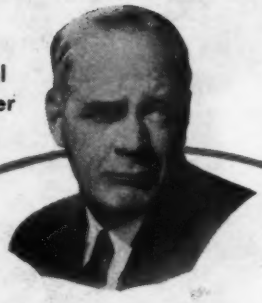
Grippit



Universal Wedge-Lock Production Vise

UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH, MICHIGAN — Fighter Plane Given by Employees — 20% Employee Bond Deductions



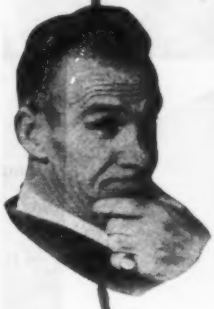
General Manager

They look to him

...for the right answer!

Production men in many tool and die plants regard Latrobe's Metallurgical Service as an integral part of their own organization. When unusual problems confront them, involving the selection, performance or heat-treatment of tool steels, they look to the Latrobe Service Man for the right answer. Past experience has taught them to depend upon him for a speedy solution.

Practical knowledge and metallurgical training enables the Latrobe Service Man to give thorough consideration to every phase of the problem, his constant contacts in the field keeping him abreast of latest developments. His services are yours on request, free of any obligation to any user of tool steel.



Tool Room Supt.

Heat-Treat Foreman

LATROBE *Metallurgical Service*

HIGH SPEED STEELS · DIE STEELS · TOOL STEELS · STAINLESS · LATROBE RED ARROW for metal-cutting tools

S-3

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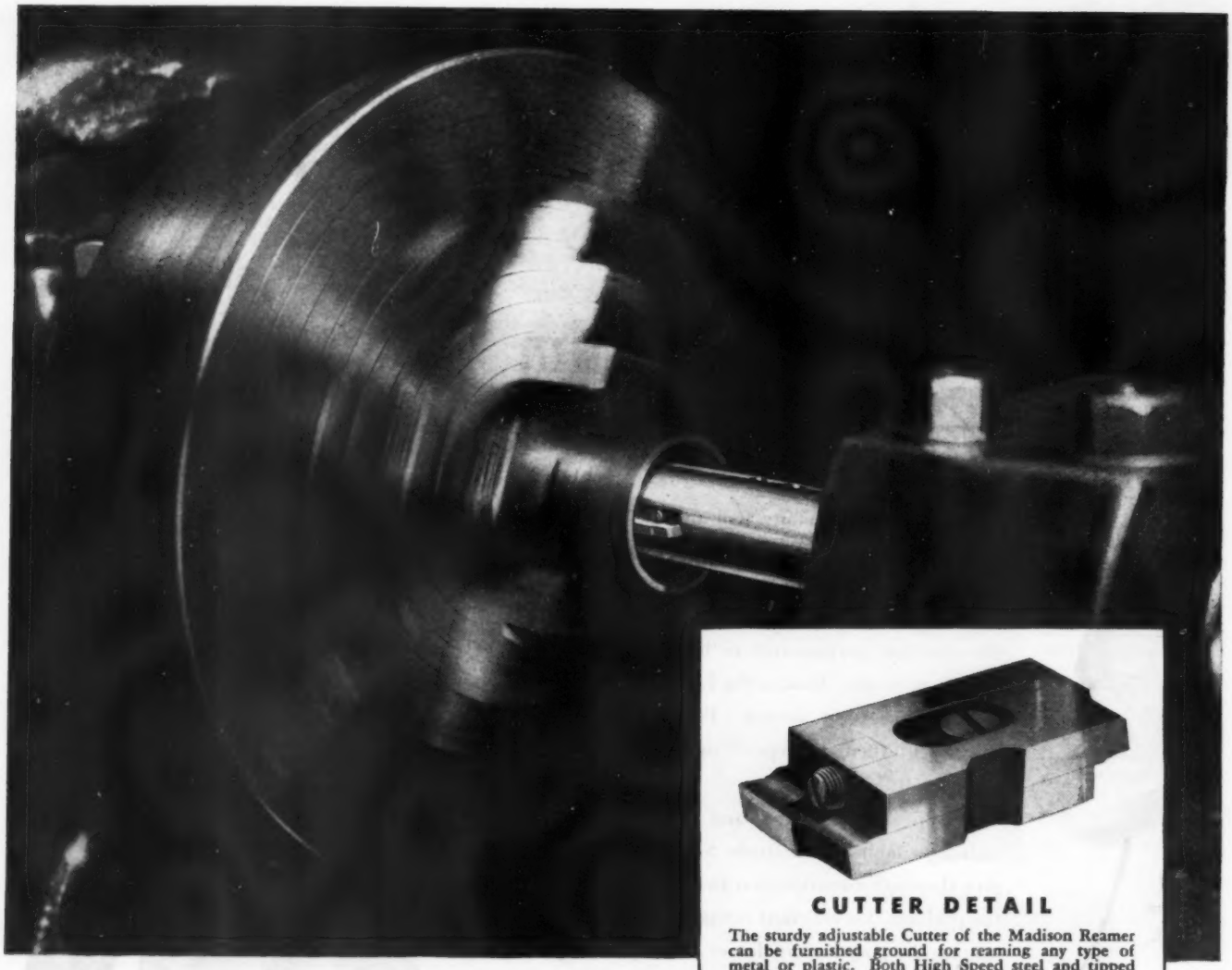

CUTTER DETAIL

The sturdy adjustable Cutter of the Madison Reamer can be furnished ground for reaming any type of metal or plastic. Both High Speed steel and tipped cutters can be furnished. A micrometer screw adjusts both cutter blades simultaneously and equally, omitting the possibility of an off-center adjustment. Thus both edges always cut.

Cooler Cutting *CUTS HOLE COSTS*

The simple and precise design of the Madison two-bladed reamer makes possible reaming operations to today's exacting tolerances even on old equipment — and produces a mirror-smooth reamed surface that seldom requires additional finishing work.

Cooler cutting is one of the advantages you get with Madisons. The Madison cutter has only two blades which contact the metal being reamed. Thus, only a minimum of heat is generated. This prevents distortion and assures the holding of a required tolerance. This cool cutting feature is especially desirable in the machining of certain light metals, where overheating must be avoided.

The two-bladed cutter also provides a greater space for better chip clearance. Here again danger of clogging and resultant overheating or scoring is eliminated, as well as any danger of freezing and damage to the tool.

Add these advantages to the other recognized features of Madisons, and then specify them for a more modern, efficient, low cost reaming operation in your plant.

Get the facts on more efficient reaming. Write for the new Madison Catalog . . . shows complete line of standard reamers, multiple reamers, bottoming tools, special tools and grinding instructions.

MADISON MFG. CO. MADISON ADJUSTABLE REAMING TOOLS **Dept. A-2, MUSKEGON, MICH.**

THE SAW WITH A thousand friends

The popularity of this new Saw Band spread like wildfire through airplane, jeep and motor plants, shipyards, large and small parts factories. Because of it, designers and engineers specify more and more of the new light metals, laminates, plastics and plywoods — metal saw operators double and triple their output.

DoALL Buttress
REG. U. S. PAT. OFF.
THE NEW WIDE-SPACED HARD TOOTH SAW

This miracle saw requires no re-sharpening, which means no work stoppages. Here's one blading you can well afford to use continuously until worn out and then insert a new one. The Buttress cuts all tough materials, including the following:

METALS	PLASTICS	WOOD ETC.
Magnesium	Bakelite	Hardwood
Aluminum	Masonite	Softwood
Brass	Zircon	Plywoods
Steels	Butyl	Builders Board
Copper	Saran	Asbestos
Bronze Alloys	Polystyrene	Wood
Kirksite	Micarta	Laminates

Available at all our Supply Points in ¼", ½", ¾" and 1" widths, in various pitches to fit any modern band sawing machine. Write for literature about the Buttress.

FREE
ENGINEERING AID

If you have any material hard to cut, send sample to us for sawing recommendations and receive written laboratory report.

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INDUSTRY'S NEW SET OF TOOLS

The DoALL Company
201 No. Laurel Avenue • Des Plaines, Illinois

Sales & Service Offices: Baltimore, Birmingham, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Dayton, Denver, Detroit, El Paso, Erie, Grand Rapids, Hartford, Houston, Indianapolis, Kansas City, Los Angeles, Milwaukee, Minneapolis, New York, Orlando, Philadelphia, Pittsburgh, Providence, Reading, Rochester, Rockford, St. Louis, San Francisco, Seattle, Statesville, Syracuse, Toledo, Tulsa.

TAPPING TIPS

From Woody Spencer's Notebook

GIVE YOUR TAPPING JOBS THE RIGHT START

You'd be surprised to know how many tapping jobs get off to a bad start because the lubricant wasn't matched up with the material being tapped. And I mean matched up. The right lubricant can make the job run 10 times easier. A while back I wrote that some of the boys had found skim-milk to be the best lubricant for copper. But that's only one. For almost every type of material there is one certain lubricant that has been found to work best—at least in the big majority of cases. Finding the lubricant that's recommended for a certain material isn't hard. Any good lubrication chart will show you. I've got one in my Handy Tap Guide. So make sure your next tapping job goes as easy as possible. Just get the right lubricant to start.

These Tapping Tips are not intended to be an infallible guide to all tapping operations. They're just intended to pass along any information that will make jobs run a little easier and quicker—maybe save some taps and cut rejections.

The individual problem that comes up with almost every tapping job requires a specific engineering solution. So, if you will send us complete information on the job (material, depth, diameter, lubricant, etc.) our engineers will be glad to make recommendations without obligations.

**Note—Woody Spencer's Tapping Tips will appear here as regularly as "Woody" gets time to write them up. Look for them. Our complete, new catalog just off the press. Send your request on company stationery.*

THE RIGHT TAP AT THE RIGHT TIME

The Wood & Spencer Company

Cleveland 3, Ohio

IMMEDIATE DELIVERY

No. 1 to 60 New High Speed Long Length

DRILLS

No. by Gage	Length	Our Price Net Each
1 to 10	6¼	$ .75
11 to 20	5¾	.75
21 to 30	5⅜	.75
31 to 40	5¼	.75
41 to 50	4½	.75
51 to 60	4¼	.75

If you buy 60 drills or more — 20% discount

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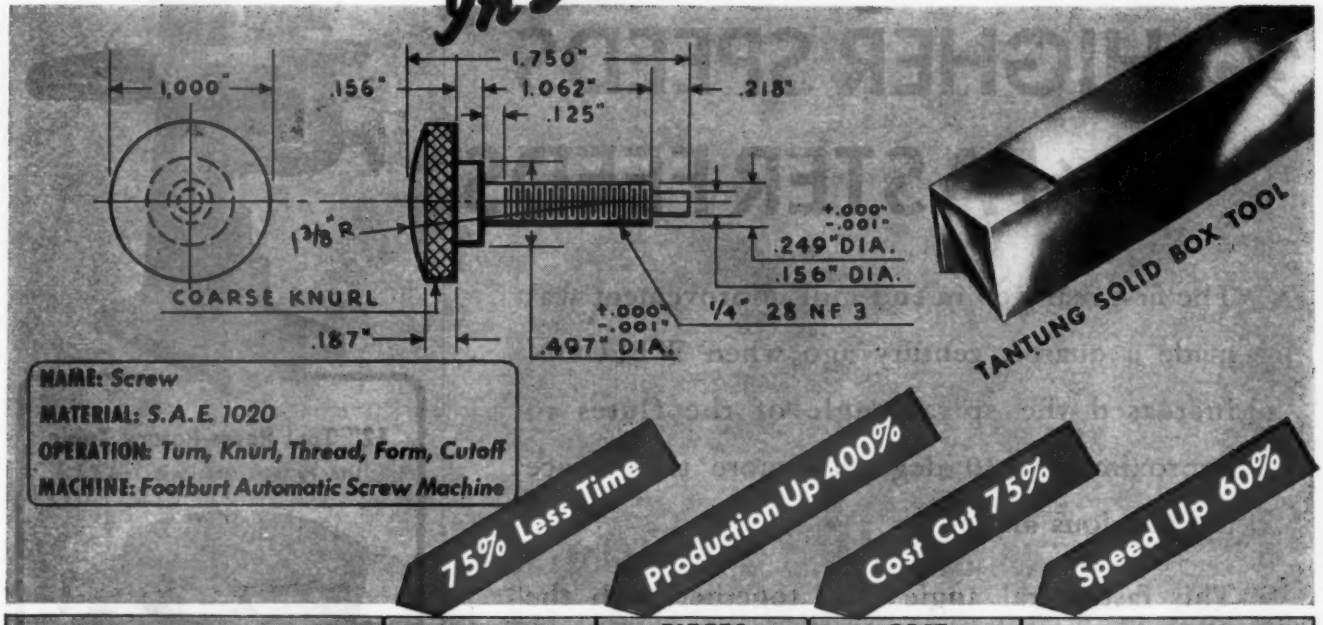
MACHINERY EXCHANGE INC.

251 CENTER STREET

NEW YORK N. Y.

Comparative Performance showing advantages of TANTUNG THE MIRACLE METAL In Screw Machine Operation



TOOLING	ACTUAL TIME	PIECES PER HOUR	COST PER 100 PIECES	SPEED R.P.M.
HIGH-SPEED STEEL	4.30	13.9	$7.17	640
TANTUNG	.95	63.2	1.58	1060

THE ABOVE TEST was made in the plant of a large aircraft manufacturer, under ordinary shop conditions. Tantung tools have demonstrated superiority over high-speed steel tools in thousands of screw machine operations.

Tantung is especially efficient in machining materials which have a tendency to gall or tear, such as stainless steel, aluminum, bronzes, non-ferrous alloys, etc.

Tantung is a hard, tough, cast alloy containing Tantalum-Columbium Carbide. It is the high red hardness of Tantung, greater than any high-speed steel, that enables it to work so efficiently. Send for the free Tantung Catalog.

VASCOLOY RAMET CORPORATION

CARBIDE TOOLS AND DIES AND TANTUNG CAST ALLOY TOOLS

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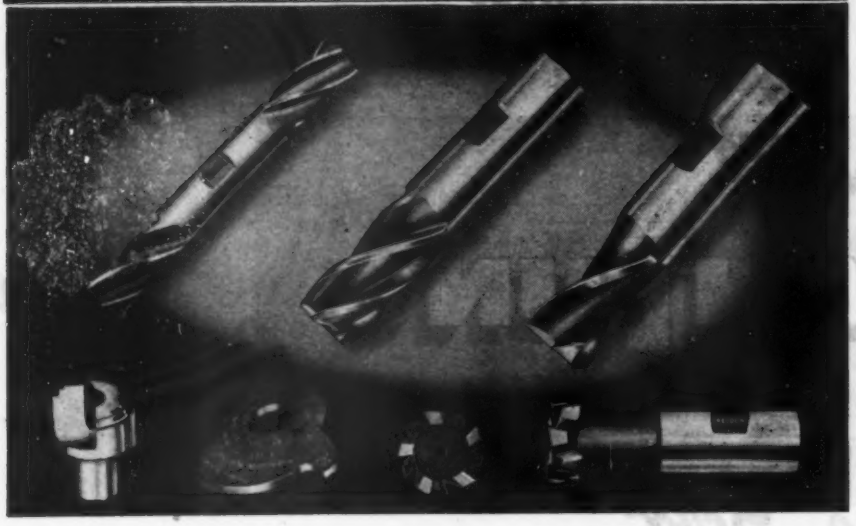
YESTERDAY'S PIONEER . . . TODAY'S LEADER



For HIGHER SPEEDS *and* FASTER FEEDS

The first real step in end mill improvement was made a quarter century ago when WELDON increased the spiral angle of the flutes to approximately 30 degrees — more than twice the previous angle.

This fast spiral angle . . . together with the hollow ground tooth and double backoff, also pioneered by WELDON . . . made possible much higher speeds and faster feeds — with greatly reduced tool breakage and job spoilage.

Insist on WELDON Tools for Well Done jobs.

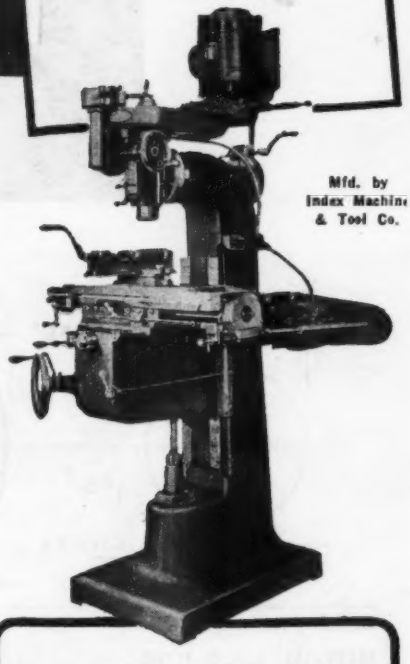
Write for Catalog 8-B.

THE WELDON TOOL CO. *Cleveland 4, Ohio*

3000 WOODHILL ROAD

INDEX MILLS

will help you on your tool, die and production work. In addition to micrometer dials on screws, verniers are standard equipment for cross and longitudinal locating. If finer precision is desired, rods and indicators are available. These in conjunction with power feed to a precision ball bearing spindle make a very versatile machine for milling, drilling and boring. *Literature promptly mailed on request.*



Mfd. by Index Machine & Tool Co.

12" Tool Room Rotary Table

Mfd. by Index Machine & Tool Co.

A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

For use on Index Mills or any other machine that will accommodate a 12" table.

BLANK and BUXTON MACHINERY

3100 E. MICHIGAN AVE.
JACKSON, MICH.

A TOOL KIT IN ONE TOOL!

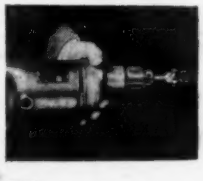
Illustrated is Model No. 4 with 2½" to 4" expansion capacity and ¾" thickness capacity. $25.00

One Clark Adjustable Hole Cutter Replaces a Whole Tool Kit of Fixed Radius Cutters

You have a tool crib at your elbow when you're using Clark Cutters. They give a smooth finish the first time without filing or deburring in steel, hard fibre, plastics, wood and other materials. Models cover variable expansions from ⅝" to 5" holes and have thickness capacities from thin sheets to 1".

Clark Hole Cutter is simple to adjust, yet performs more efficiently than fixed radius cutter of same size.

In portable electric drill, Clark Hole Cutter easily cuts steel plate as well as pipe, plastics, hard fibre, Transite, etc.



FOR COMPLETE INFORMATION, CALL YOUR CLARK CUTTER JOBBER TODAY, or write for catalog. AM-6-HC

Adjustable Tool Holder

Grinding Fixture

CLARK CUTTERS

Robert H. Clark Company

9330 SANTA MONICA BOULEVARD • BEVERLY HILLS, CALIFORNIA

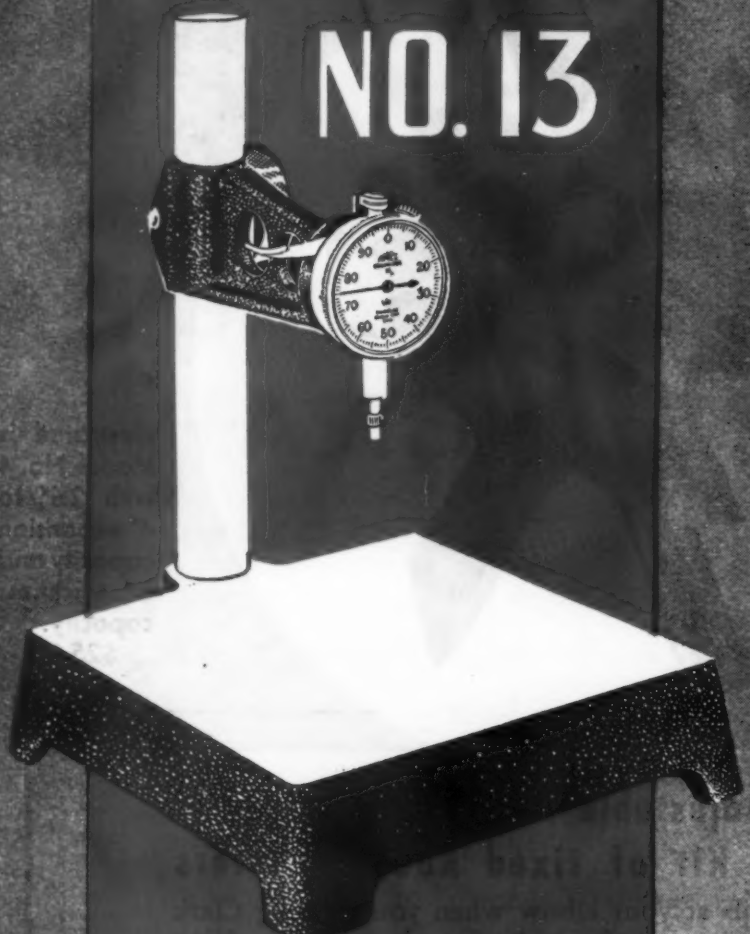
Adjustable Counterbore

Adjustable Facing Mill

ADJUSTABLE CUTTING TOOLS FOR ALL MATERIALS

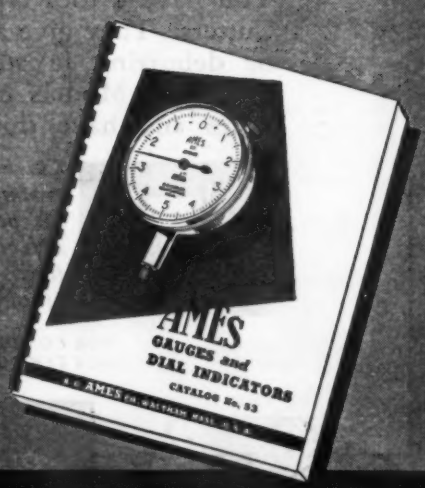
AMES COMPARATOR

NO. 13



One of a number of very popular AMES COMPARATORS for measuring flat, round and odd shaped parts. The 8" square cast iron base of this popular model is ground flat on top and often fitted with V blocks, anvils or stops of various kinds. The bracket which holds the 2¼" indicator extends 4" over the base and is adjustable for height on the 9" column. Total height is 11-3/16" and measuring capacity is 6". Net weight is 16 lbs. Indicators are graduated in .0001 and .001 with rack spindle up to 1".

Other types are illustrated in our 56 page catalog.



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For greater *accuracy, speed* and *economy* in *your* thread cutting

MODERN

STATIONARY TYPE SELF-OPENING

DIE HEADS

Modern Self-Opening Die Heads thread diameters from ½" to 7" in standard heads, and up to 14" in special heads . . . accurately, fast, and economically. They are adapted to practically every thread cutting operation within their capacity. Designed for use in hand screw machines, turret lathes, and other machines where the die heads are used in a stationary position.

PROMPT SHIPMENT....USUALLY FROM STOCK

- Wider threading range with greater flexibility. Unusually well suited to general purpose diversified threading work.
- Soundly designed and carefully built to insure maximum productiveness combined with long lasting, accurate service.
- Made with the least number of parts. Hardened and ground throughout. Wear is held to a minimum.
- Simplified design makes chaser change quick and easy. No special tools required.

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DIVISION OF

CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

NEW ALUMINUM

EASIER CUTTING

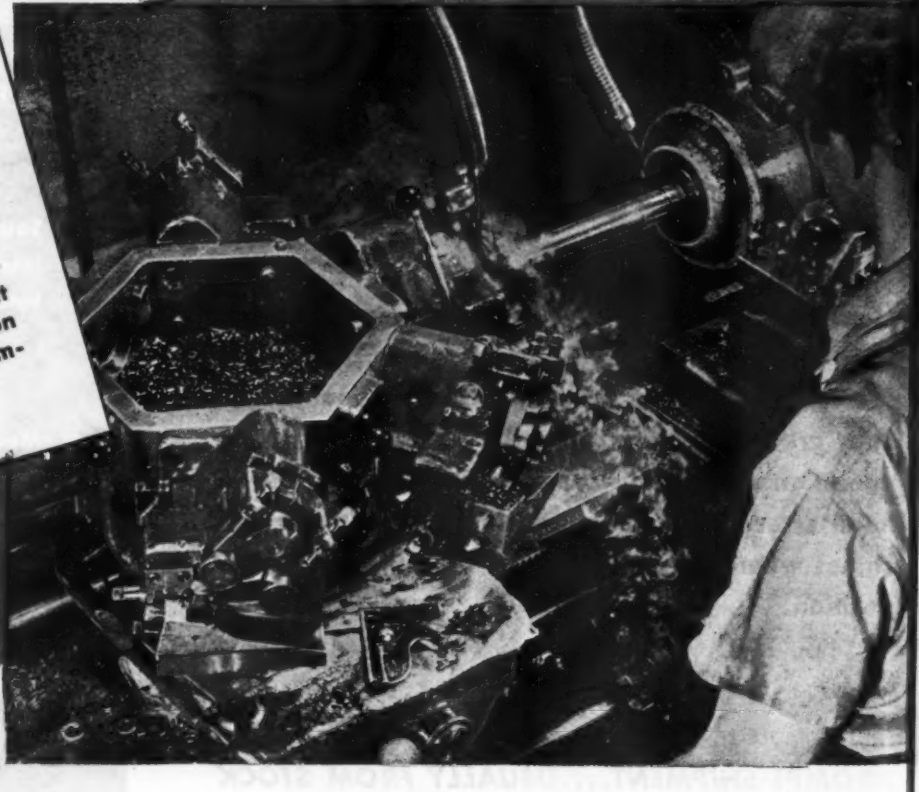
The extremely high "wetting out" ability of new Tycol #690 effects material savings in cutting time. Greater output is assured.

LONGER TOOL LIFE

Tools operating in conjunction with Tycol #690 have a long useful life. Due to all the Oil's "anti-weld" properties, the problem of tool "build-up" is greatly reduced.

FINER FINISHES

Tycol #690 will not discolor Aluminum or alloy products . . . also its ability to reduce tool "build-up" prevents break-offs, gouging or scarring finished surfaces. These are important facts to consider. Insist on Tycol #690 Aluminum-Cutting Oil.



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TYCOL

TYCOL INDUSTRIAL

ENGINEERED FOR EVERY

Cutting Oil

...engineered for production!

TIDE WATER ENGINEERS A CUTTING OIL TO SUIT EVERY JOB

Perhaps you are dissatisfied with your production from present cutting lubricants. If so, call in a Tide Water engineer to survey your operations. From our complete line of Tycol Cutting Oils — "scientifically engineered to fit the job" — he will gladly help you select the one most suited for speedy production on your particular work. Get in touch with your nearest Tide Water Associated office today.

During the past two years, in exhaustive field tests, Tycol's Cutting Oil #690 definitely proved its superiority over other lubricants marketed for machining aluminum and aluminum alloy products.

Because of this superiority – now, for the first time, we offer it to you to help meet the greatly accelerated demand for aluminum parts production.

This new aluminum cutting oil is highly resistant to oxidation; thus it virtually eliminates the formation of gum and sludge deposits in the machines. This feature, together with the oil's "anti-welding" properties and "wetting out" ability, assures lengthened tool life, improved surface finishes, and easier chip disposal.

Further, Tycol #690's low Viscosity and extremely high Flash Point results in a minimum of carry-off and consumption . . . more production at less cost.

Call or write your nearest Tide Water Associated office for complete Tycol #690 information.

Makers of Famous Veedol Motor Oil

CHECK THESE PRODUCTION BOOSTER FEATURES

Odorless	Anti-Welding
Transparent	Oxidation Resistant
Less "Carry Off"	Greater "Wetting Out"

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1. SPEED—The correct setting of the teeth in Victor Hack Saw Blades assures fast cutting and full side clearance.

2. RELIABILITY—Victor Blades lessen shutdowns on the job. They are tough and durable.

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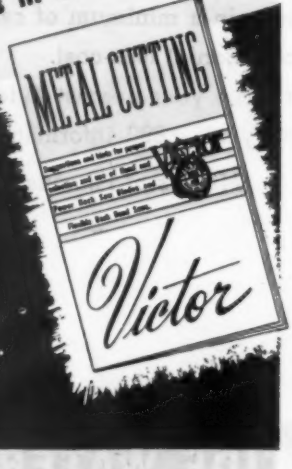
Guide to Better Sawing

Send for a copy of this pocket-size booklet on how to select, use, and care for a hack saw blade.



VICTOR

VICTOR SAW WORKS, Inc., Middletown, N. Y.

Makers of hand and power hack saw blades, frames, and metal cutting band saw blades.

Columbia TOOL STEEL

TROUBLE-FREE
Dependable production is the need of the day.
Good Tool Steel is the answer with its trouble-free, high production performance.
It pays to use Good Tool Steel.

COLUMBIA TOOL STEEL COMPANY

ARTHUR T. CLARAGE, PRESIDENT

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PALMGREN ANGLE VISES

HEAVY-DUTY Model

For Quick—Accurate Set-ups

PALMGREN Heavy Duty Angle Vises are built sturdy and rugged for tough, heavy jobs. They are accurately graduated in degrees, can be quickly adjusted to any angle, stay locked under severe service and save valuable hours otherwise wasted in tedious make-ready, wedging or making temporary jigs and fixtures.

Jaws are hardened and ground. Special outstanding features are the size and opening of jaws—4" Jaws open full 4"; the 6" Jaws open full 6" etc., with corresponding depth of Jaws. Vise can be used as ordinary vise when lowered to horizontal position. Swivel bases furnished if desired. Sizes 4", 6" and 8" Jaws and openings. Prompt deliveries.

Write for Circular 347

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Mfrs. of PALMGREN PRODUCTS for over 25 years

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PRECISION WORK AT ANY ANGLE

Announcing Oakite

TRI-SAN

It Kills Odors . . . Disinfects . . . Cleans Surfaces!

Simultaneously Does ALL 3 in ONE Low-Cost Operation

Designed to simplify and increase the effectiveness of plant hygiene procedures, Oakite TRI-SAN is a basically NEW development combining the functions of (1) deodorizing; (2) disinfecting surfaces; and (3) removing light soils from surfaces . . . ALL in ONE material. It may be used practically any place where good housekeeping and sanitation are recognized as a safety precaution that pays dividends in increased employee health protection and in improved working conditions.

Gives You Triple Sanitizing Action For One Cent a Gallon!

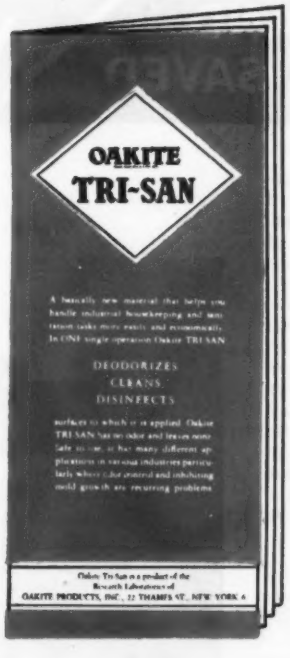
Many advantages accrue from the use of Oakite TRI-SAN. It saves time because it performs its work quickly and with surprising thoroughness. Manhours are conserved because its triple-action on surfaces helps make every sanitation and odor control task easier. And it has the added feature of LOW COST. Oakite TRI-SAN solutions are so economical to use that for most tasks, you obtain a deodorizing, disinfecting and cleaning solution for only ONE CENT a gallon.

WHAT Is Oakite TRI-SAN?

It is a mildly alkaline, free-flowing white powder, completely soluble in water, forming a clear, colorless solution. It contains no hypochlorites or iodine, no caustics, no phenol or mercurial type compounds or heavy metals, no volatile solvents or corrosive ingredients. The safety factor of Oakite TRI-SAN solutions, from a use and handling standpoint, is one of its outstanding features. Solutions of Oakite TRI-SAN have NO odor . . . and leave none.

Oakite TRI-SAN Is Easy to Use and Apply

Oakite TRI-SAN may be used in either cold or warm water. Warm or hot water accelerates its germicidal and odor destroying action. You merely add Oakite TRI-SAN to water in recommended concentration and stir for a moment to dissolve all ingredients. Solutions are applied directly to surfaces with brush, mop, cloth or sponge.



WHERE to Use Oakite TRI-SAN

The triple sanitizing action of Oakite TRI-SAN may be advantageously employed in factories, mills, shops and in various lines of business where odor control and sanitizing tasks are performed daily in connection with plant washrooms, locker and rest rooms, first aid rooms, toilet bowls and seats, urinals, shower stalls, wash fountains, plant cafeterias, floors, walls, woodwork. Also for destroying obnoxious odors in drains, storage areas.

Free 20-page Booklet Gives You Complete Story

This interesting, unique booklet, just off the press, describes the many different applications of Oakite TRI-SAN in various industries. It gives case-histories, formulae and directions for using. Plant executives, safety supervisors and engineers, maintenance superintendents and others will find it a valuable guide to improved plant sanitation. Write for your FREE copy today. It will be mailed promptly upon receipt of your request.

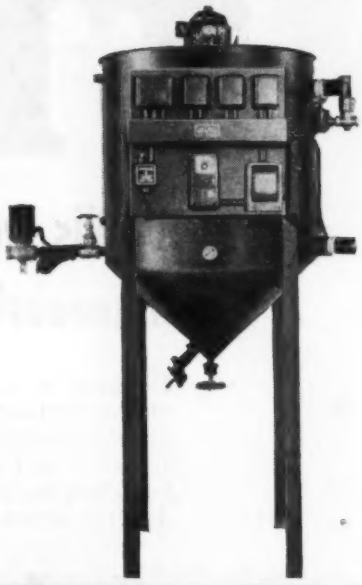
Oakite Products, Inc., 26 Thames Street, New York 6, N. Y.

Technical Service Representatives Located in All Principal Cities of the United States and Canada

PREVENT CONTAMINATION—EXTEND TOOL LIFE

with the NEW BARRETT COMBINATION STERILIZER AND SEDIMENTOR for CUTTING OILS . . . .

Barrett Sterilizer and Sediment Precipitator arranged for fully automatic operation.



Protects your operators against infection—insures more and better work from your cutting tools—by sterilizing your cutting oils and precipitating sediment *at the same time.*

The NEW BARRETT STERILIZER AND PRECIPITATOR combines these two operations in one piece of apparatus which can be depended on to handle both operations effectively, efficiently and economically. Sterilization is by heat and is a positive active operation in the line ahead of the supply tank. By locating in this position, contamination is intercepted thereby the cutting oil is conditioned for safe, bacteria-free reuse.

Because of the heat to which the oil is subjected during sterilization, the viscosity of the cutting oil is reduced, thereby encouraging precipitation of minute heavy particles. The sediment thus liberated settles out and drops by gravity to the bottom of the sterilizer where provision is made to scrape the precipitated solids from the conical bottom and clean them out.

By thoroughly and constantly sterilizing and effectively removing solid matter, the Barrett Combination Sterilizer and Sedimentor reconditions cutting oil for reuse; sterilized for safety's sake and abrasive-free for longer tool life.

GET COMPLETE INFORMATION NOW

These units are available for floor, wall and post mounting and are furnished with semi-automatic or full automatic control as required. Send at once for detailed information on this timely Barrett development

THE LEON J. BARRETT COMPANY, 1800 Grafton Road, **WORCESTER, MASS.**

Designers and Builders of Centrifugal Machinery

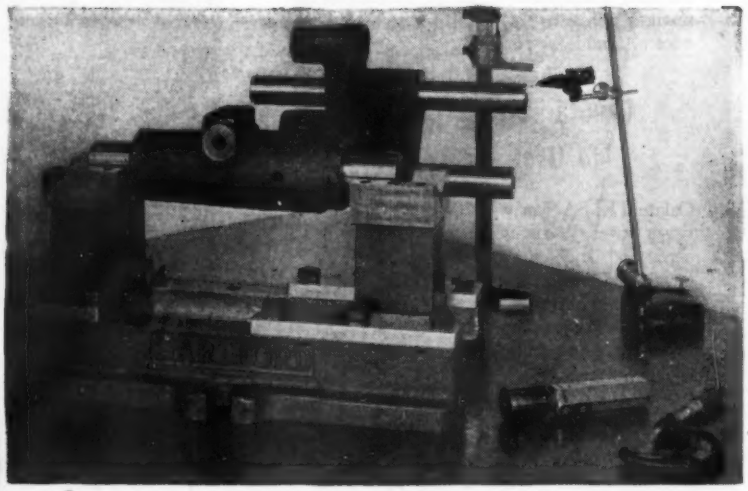
TOUGH SET-UPS ARE MADE EASY AND INSPECTION TIME SAVED

with the **HARTFORD V-BLOCK FIXTURE**

Specially designed for the accurate holding of irregular work, the Hartford V-Block Fixture provides a tried and proved means of speeding up set-ups and is an outstanding convenience for inspection of this class of work.

It is applicable to milling, boring and drilling operations where set-ups might otherwise involve the necessity for costly special fixtures. Because of the high accuracy in the parts comprising the fixture, the secure holding means provided and the precision machining involved in its production, the Hartford V-Block Fixture can be depended on for holding work which calls for close tolerances in machining. This same degree of accuracy can be taken advantage of when parts are inspected and checked after machining, because the base is carefully scraped for mounting on surface plates.

Any shop can find many uses for this new device which will pay for itself many times over in better work, fewer rejects and time saved. Investigate immediately.



The Hartford V-Block Fixture, mounted on surface plate and being used for set-up of an irregular casting. Quick, accurate checking for parallelism of bored holes, hole spacing and milled faces can be made after machining.

THE HARTFORD SPECIAL MACHINERY CO.

HARTFORD 5, CONN.

Makers of the famous Hartford Super-Spacer

THESE ARE THE TIME-SAVING FEATURES YOU'LL NEED IN . . .

YOUR NEXT AUTOMATIC LATHE

● Changes in production requirements, changes in part design and changes in processing methods need not obsolete your turning equipment. That's why many manufacturers are buying Sundstrand automatic lathes at a time when it's difficult to anticipate future needs. They offer the advantages of multiple tool turning on *both* short-run and mass production turning. Here are seven reasons why:

❶ QUICK CYCLE CHANGEOVER

So that adjustments for various sizes and types of parts can be made rapidly with a minimum of down-time of the machine.

❷ SIMPLICITY OF TOOL ADJUSTMENT

So that operators or set-up men can readily learn to make tool set-ups and changeover.

❸ WIDE RANGE OF CARRIAGE CYCLES

Easily adjusted for many different sizes of parts and types of tool uses.

❹ WIDE FEED AND SPEED RANGE

Suitable to cover a wide range in size of parts to be machined.

❺ ADEQUATE HORSEPOWER

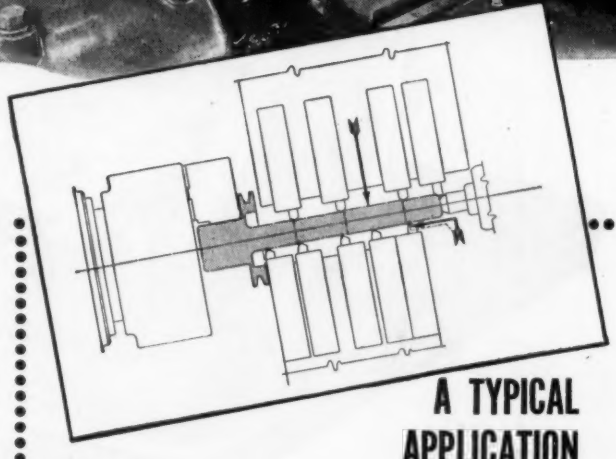
So that multiple tooling can be used to shorten cutting time; also so that cemented carbide and other modern cutting tools can be used to capacity.

❻ AUTOMATIC CYCLING

For accurate duplication to close limits of all parts in the lot. Also so that operator can, on occasion, run more than one machine.

❼ HIGH RAPID TRAVERSE RATE

So that cutting tools can be advanced to the cut and returned after the cut in the least possible time.



A TYPICAL APPLICATION

OVER 33 HOURS SAVED TURNING A LOT OF ONLY 200 PARTS

● This airplane engine tail shaft is produced in lots of 200, requires three turning operations. It used to take 13 minutes to complete the operation shown on the tooling diagram. The same operation performed on a Sundstrand requires only 3 minutes.

● The fast automatic operating cycle and high rapid traverse rate of 250 inches per minute often slash half the time from previous production rates. In addition modern cutting tools can be worked to capacity on these amply powered lathes.

Get the Answers to Your Short-Run Turning . . . Continuous Production . . . and Special Turning Problems in This FREE Book.

Over 20 different turning jobs are described in this 44 page booklet. Short-run, mass production and special turning jobs are all described in detail. Write for your copy today. Ask for Booklet No. 137

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SUNDSTRAND MACHINE TOOL CO. ROCKFORD ILLINOIS U.S.A.

SUNDSTRAND

MACHINE TOOL COMPANY

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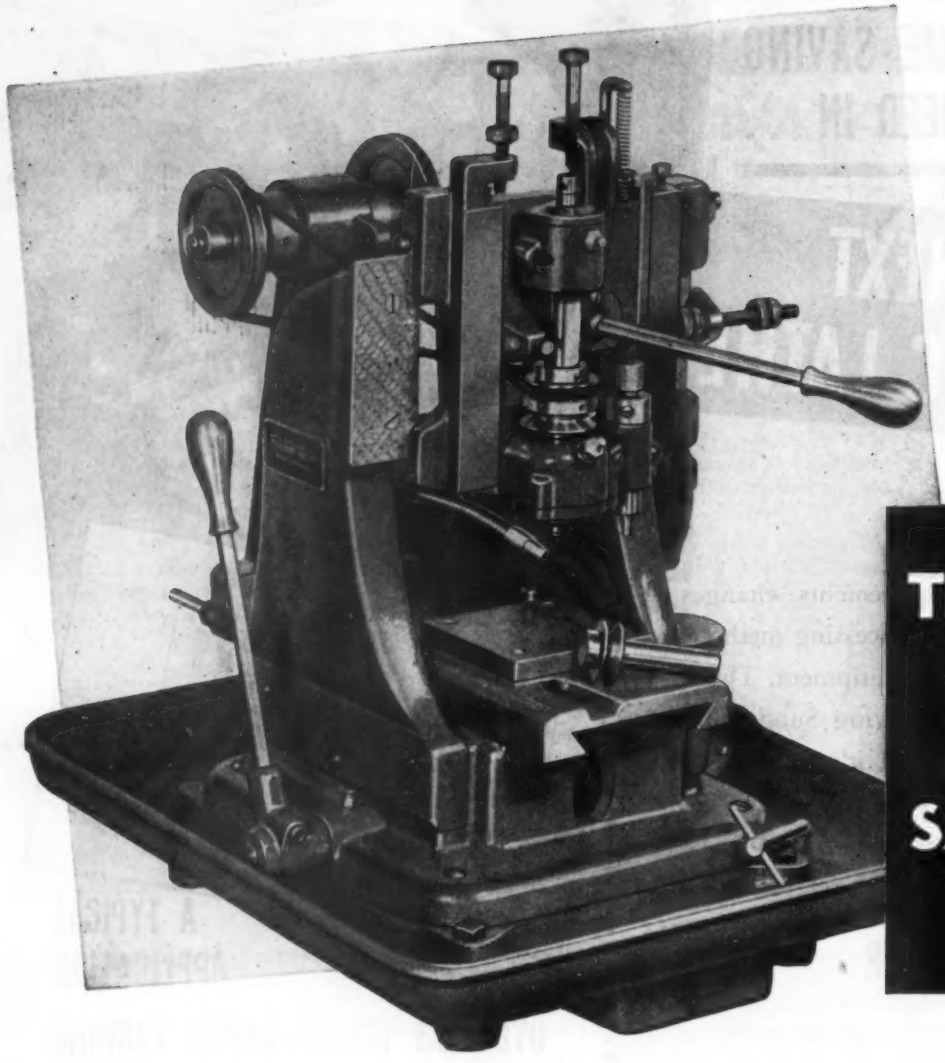
RIGIDMILLS • AUTOMATIC LATHES • SPECIAL MILLING AND TURNING MACHINES



THIS WADE BENCH PROFILER SAVES YOU MONEY

This Wade Motor Driven Bench Profiler saves you money because it enables you to produce small precision parts quickly and more accurately. With it you can do profiling, milling, slotting, recessing, and routing operations more efficiently and at a lower cost. You can handle a wide variety of small parts with this time-saving, money-saving Wade Profiler, and free larger machines for heavier work.

The Wade Profiler is precision built for speedy, accurate work. The cutter spindle operates at four speeds, from 1000 r.p.m. to 8000 r.p.m. and has a working area of 2" x 4" with 1¼" vertical movement. Unskilled help can quickly become expert in using this profiler . . . new operators can immediately start producing accurate parts in money-saving time for you.

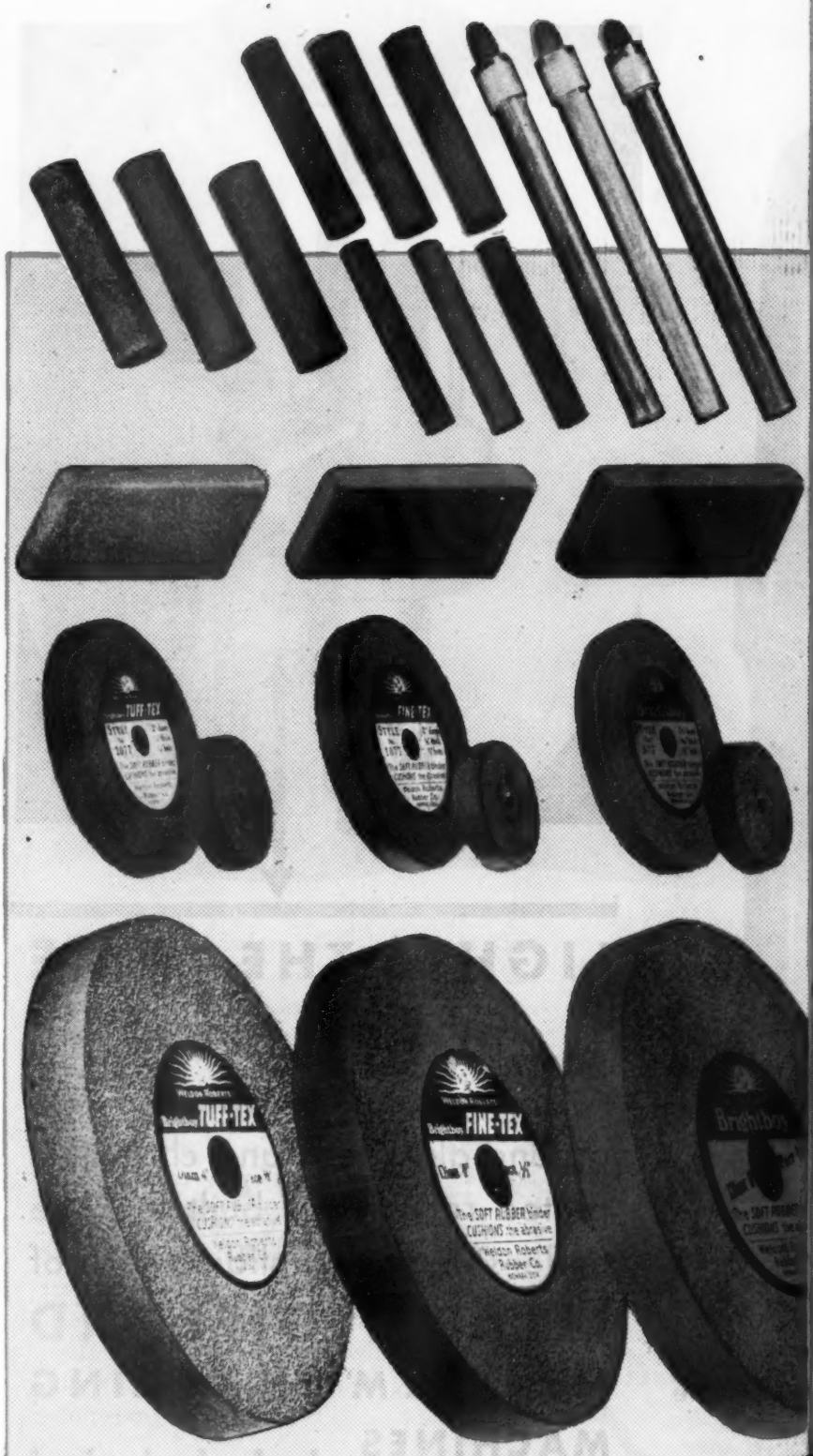
Get complete details of this money-saving profiler. Write today for bulletins.

Wade

Bench Lathes and Profilers For Precision, Versatility And Stamina

THE WADE TOOL COMPANY

WALTHAM 54, MASSACHUSETTS



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COMPLETE LINE
OF
RUBBER-CUSHIONED ABRASIVES
In
3
TEXTURES

For an
EXTENSIVE VARIETY OF CLOSE-TOLERANCE, PRECISION
BURRING, FINISHING, POLISHING

WHEELS
BLOCKS
RODS
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Brightboy TUFF-TEX

Tougher texture, for finishing hard metals. The tougher binder accents the abrasive action, yet retains the soft rubber cushion, finishing and polishing in one operation.

Brightboy FINE-TEX

Smoother, finer texture for work on softer metals, producing special finishes and for applications where the coarser wheel might not be suitable.

Brightboy STANDARD

Brightboy STANDARD texture is a favorite for burring, finishing and polishing on the widest variety of metals and metal parts.

WELDON ROBERTS
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BRIGHTBOY
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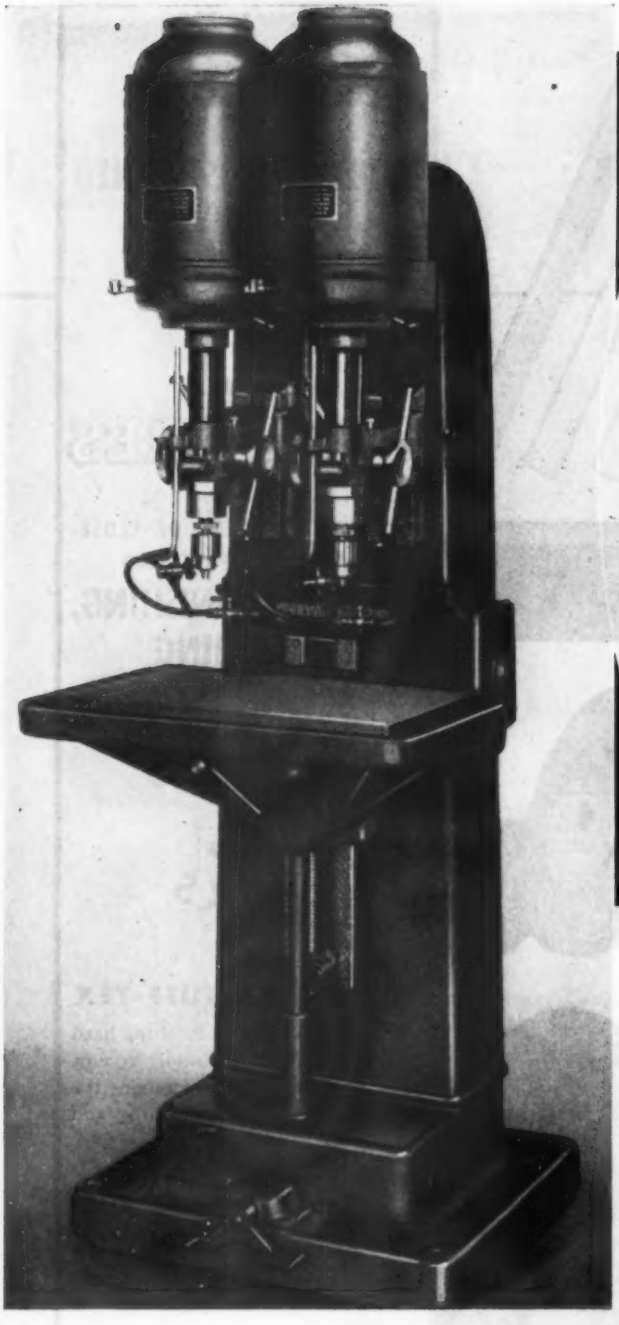
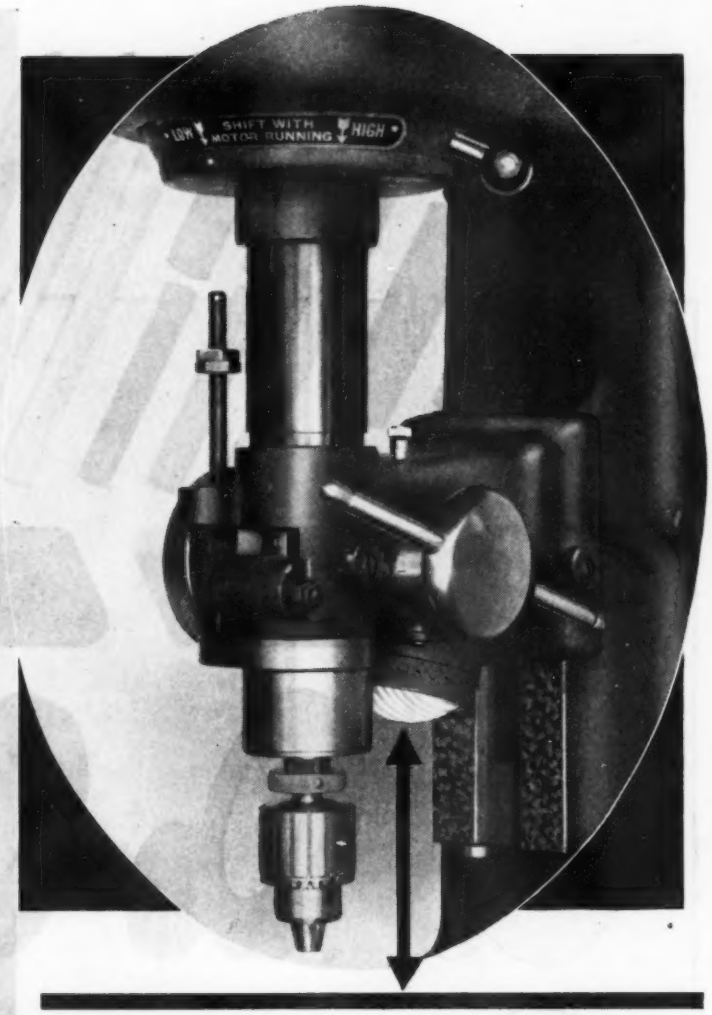
Weldon Roberts Rubber Co.
Newark 7, N. J.



The Ratchet Type Feed Lever permits adjusting to the convenience of the operator. The sliding head is counter-balanced independently of the spindle for easy vertical adjustment.



LIGHTS THE TABLE *without glare*

A Low Voltage Mazda Lamp with ground glass lens and chromium plated reflector is built into the under side of each sliding head of

LELAND-GIFFORD No. 1 LMS DRILLING MACHINES . . . . . .

LELAND GIFFORD

WORCESTER 1 MASSACHUSETTS, U. S. A.

Let your ISD* help you solve your RETOOLING PROBLEMS

● Beating swords into plowshares may have been a simple job in Biblical times, but changing from war-time to peace-time production today is a complex and troublesome task.

Many manufacturers will need all the help they can get. They will find that now, as always, it pays to telephone their *Industrial Supply Distributor *first.*

Your *Industrial Supply Distributor stands ready to help you solve your reconversion problems. He probably carries *in stock* the tools and equipment you will require . . . and if not, he knows how to get them for you promptly.

Cleveland Twist Drills are shown here drilling holes in flange yokes for universal joints. The holes are 8⅜" deep and ⅜" in diameter. ACTUAL PERFORMANCE: 165 flange yokes, or 1320 holes, in 8 hours. Perhaps you too have some difficult drilling problem. If so, please inquire. We will be glad to help you.

Telephone your * INDUSTRIAL SUPPLY DISTRIBUTOR FIRST!

ARMY NAVY — ARMY E NAVY

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49TH STREET
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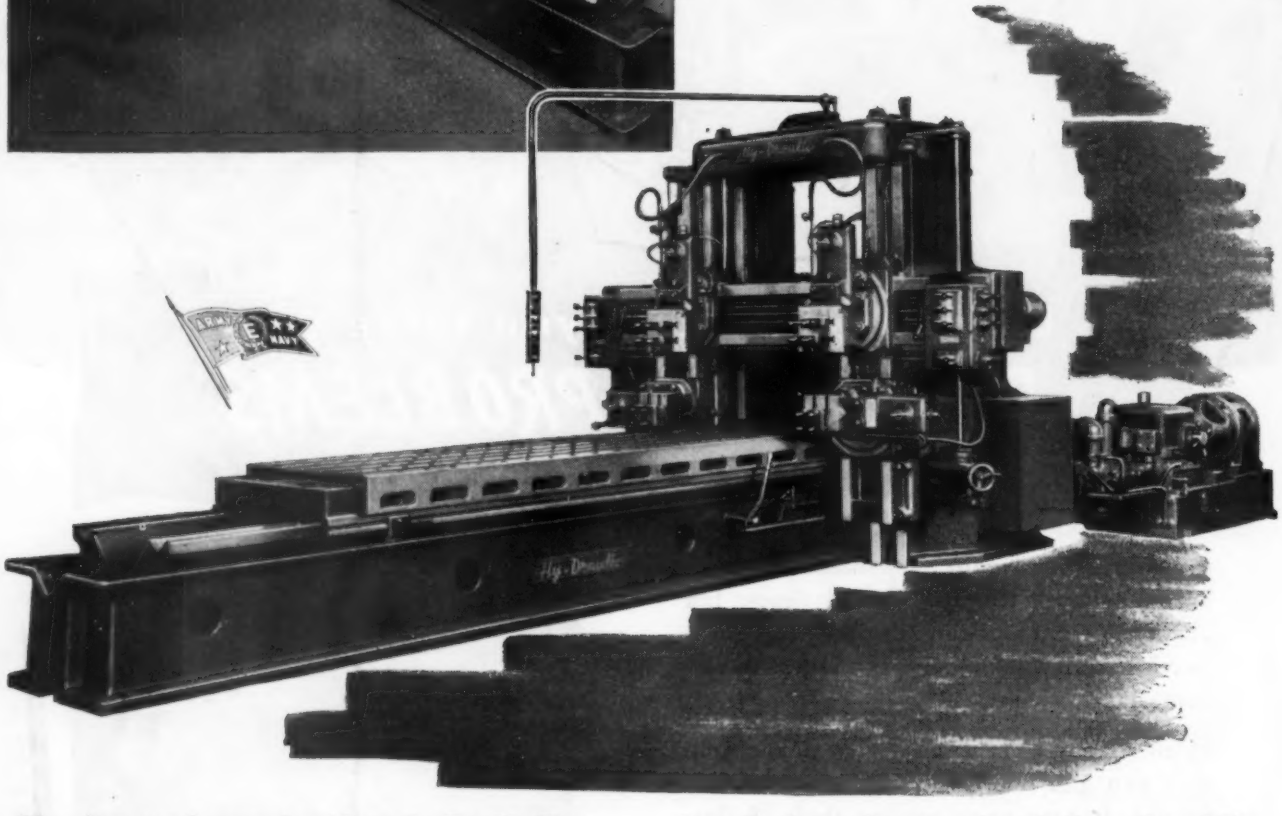
COST-CUTTER ON THE BIG JOBS



Here is a good example of how the Double-Housing Hy-Draulic Planer employs the obvious advantages of hydraulic actuation to reduce heavy duty planing costs. Photo shows this machine planing a 135" iron casting weighing about 10,000 lbs. Surfaces planed include two parallel guideways, each having three surfaces 6 feet long which are machined about 46" above the table top. Also planed are a center pad, a long narrow transverse rib and two large pads on the sides of the casting.

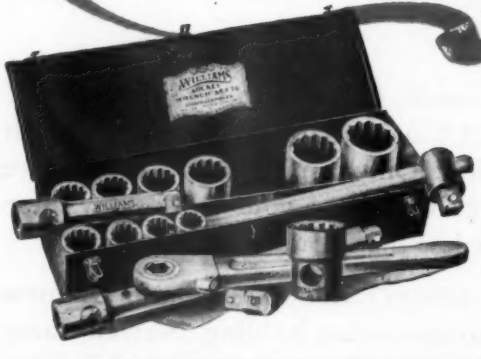
The Double-Housing Hy-Draulic Planer does this whole job in an average of 13 hours, floor-to-floor time. Such results stem directly from the ability of Rockford Hy-Draulic machines to take more strokes per minute, remove more metal per hour.

As the size of the work-piece increases, so does the importance of the economies that the Double-Housing Hy-Draulic Planer can effect in your shop. These machines are made in four sizes: there's one to suit your requirements perfectly. Write for complete details today. Ask for Bulletin 1123.

4502

ROCKFORD MACHINE TOOL CO., ROCKFORD, ILLINOIS

Action and Power with "SUPERSOCKETS"



● When you want *action* and the safety of sure-gripping *power*, you can't beat Williams "Supersockets." These versatile wrenches, with their various combinations of handles, parts and socket types, provide greater speed even under adverse working conditions.

Williams "Supersockets" are available in 5 different patterns, with drives ranging from 1/4" to 1" square. Socket openings range from 3/16" to 2-3/4". Sold by Industrial Distributors everywhere.

J. H. WILLIAMS & CO., Buffalo 7, N. Y.

WILLIAMS

DROP-FORGINGS AND DROP-FORGED TOOLS

Save Designing Time

Specify

SIEWEK

Fixture Clamps and Fittings

Manufacturers of

SIEWEK

Rapid Clamping Drill Jigs

"Siewek Tools are Speeding the War Effort"

Nine times out of ten, Siewek Clamps can take the place of "specials." Save 50 to 75% of designing time . . . and much of the cost of production. Only a minimum of details are required in fitting Siewek Clamps to your work. Buy these complete assemblies for less than your cost of designing.

Rugged construction assures maximum strength. Uniform right angle pressure provides secure holding. Siewek clamp bars are heat-treated and hardened to give years of safe service.

Write today for full size template drawings for layout use.

SIEWEK TOOL DIVISION. DOMESTIC INDUSTRIES, INC.,

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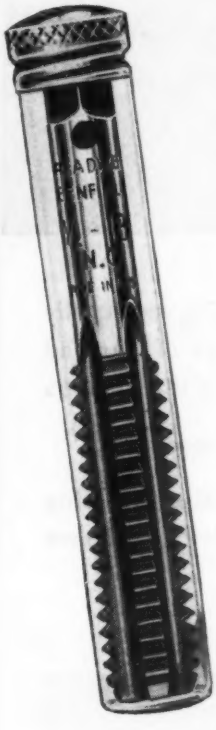

A good thing to think about this summer

No matter how hot the production pace Threadwell COLD-TEMPER Taps have a refreshing way of turning out clean, accurate threads and more of them per tap. Threadwell *cold-tempering* at 120° below zero refines the metal structure all the way through. It's not just a surface treatment. Threadwell *Cold-Temper* Taps cut better threads and keep on cutting them longer between each sharpening.

Try them on steels, cast iron, alloys, plastics—any tapping job however tough. You'll never go back to ordinary heat-treated high speed taps.

All you need to do is ask your local Threadwell Distributor to make the next lot COLD-TEMPER Taps.

Perspiration-Proof, Too!

Threadwell *Cold-Temper* Ground Thread Taps come in this perfect protective package—the TAP-CAPSULE. It seals out dust, dirt and sweaty fingers yet permits instant identification before unwrapping. *Threadwell greaseless rust-proofing* makes every tap clean and dry to handle, always ready for instant use.

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CANADA, Bridge Machinery Co., Montreal;
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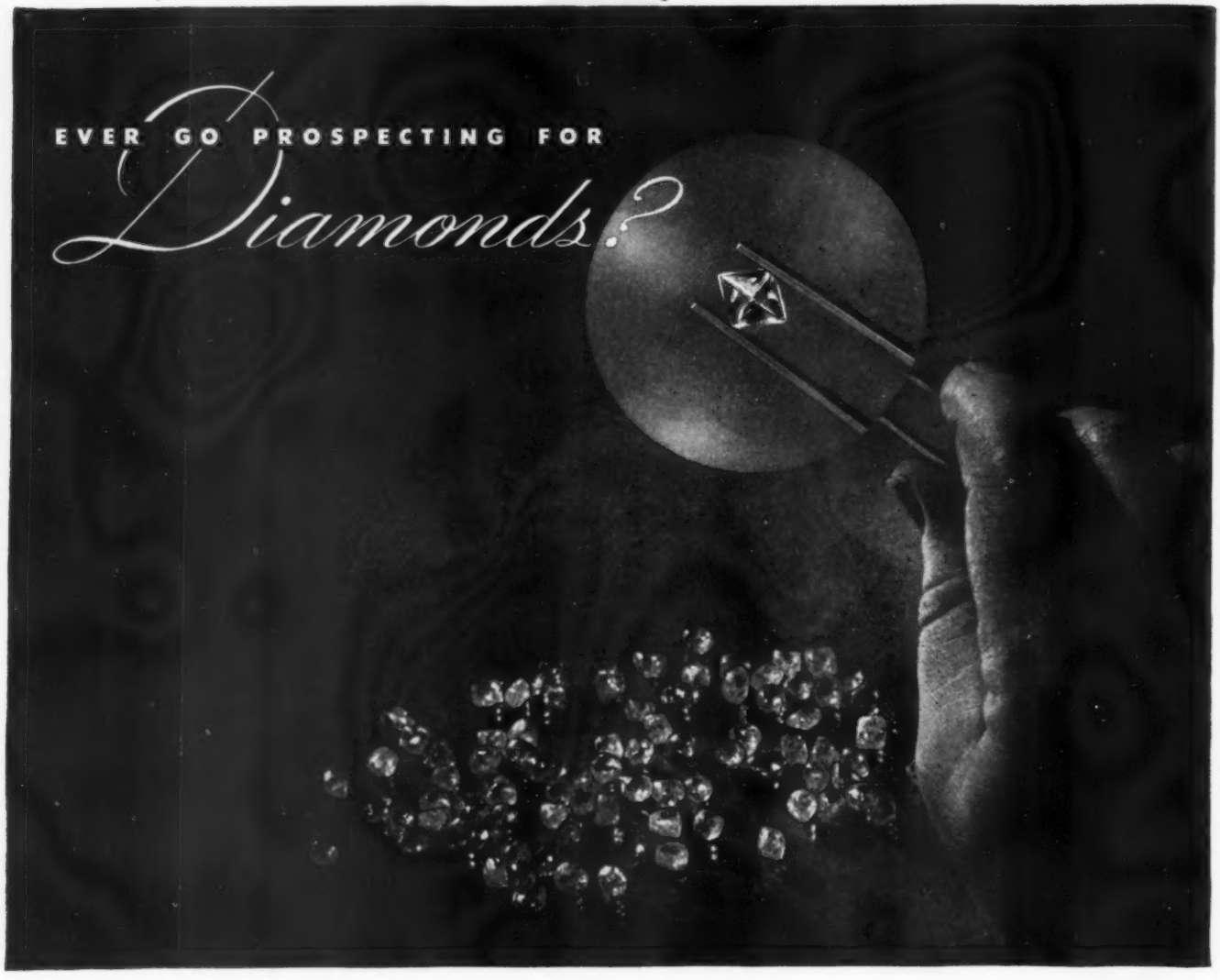
THROUGHOUT THE WORLD

Threadwell
SINCE 1902
"TAPS OF DISTINCTION"

THREADWELL TAP AND DIE COMPANY • GREENFIELD, MASSACHUSETTS, U. S. A.



Do you like to spread out a package of diamonds and sort them over, looking at size and shape and structure and color, finding the stones with the twisted, knotty grain that stands up so well on the tough jobs, mentally marking the big rugged fellows for the big, coarse-grained wheels, smaller stones for the finer wheels, special shapes for this tool or that?

That's how experienced diamond buyers—production men, purchasing agents and heads of grinding departments—have been buying Wheel Trueing diamonds for more than a third of a century although, in many instances, we have come to know their requirements so well that they leave the matter of selection entirely in our hands.

Our sales offices throughout the country can get diamond assortments to you quickly for your inspection and selection—and can give you equally efficient service in supplying any type of diamond tool—standard or special—which you may require.

Your inquiry will receive prompt attention.

Send for a copy of our booklet, "Tips on Using Diamond Tools." You'll want copies for all your operators.

WHEEL TRUEING TOOL COMPANY

3200 W. Davison Avenue
Detroit 6 • Michigan

575 Langlois Avenue
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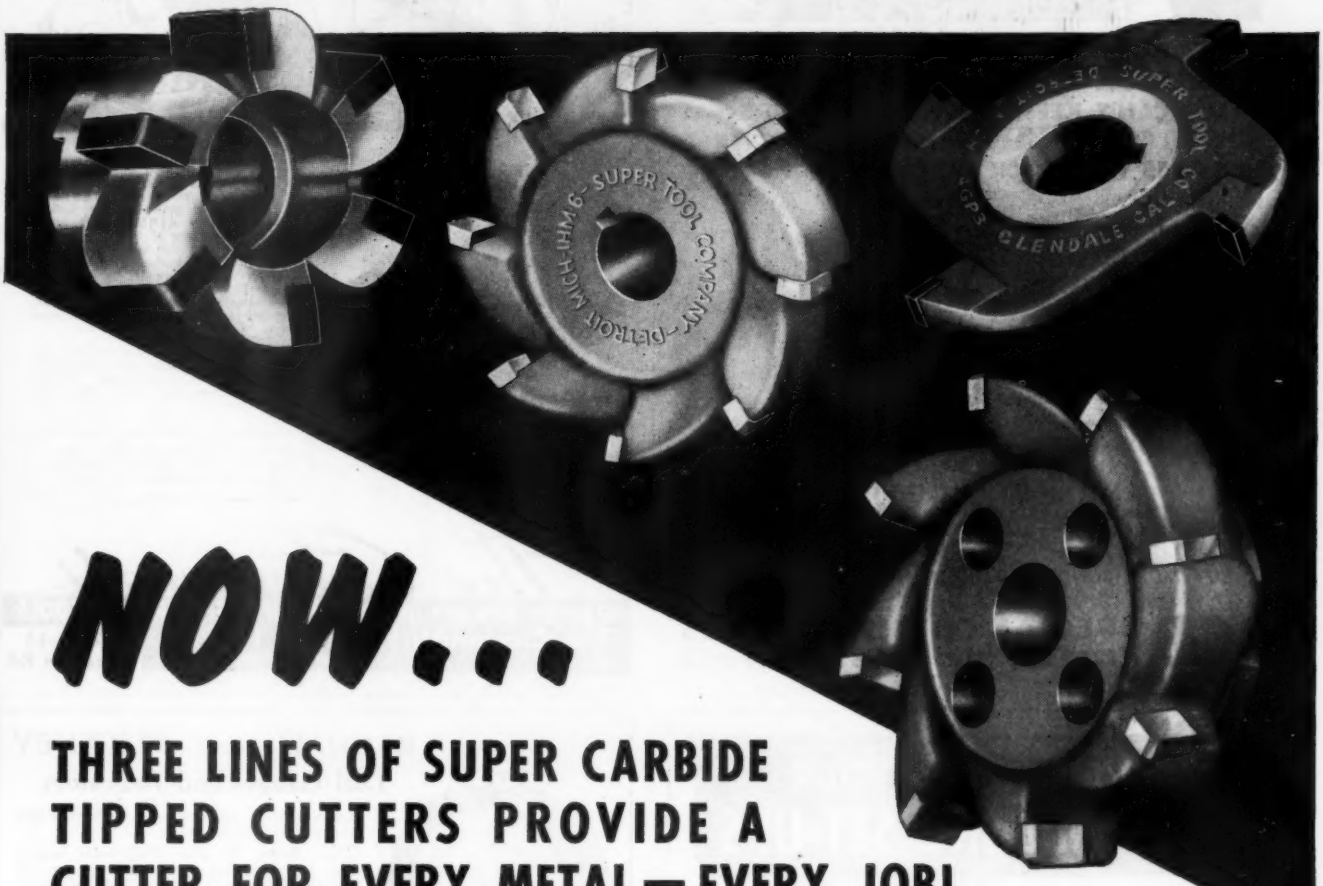
NEW SUPER CUTTERS FOR CAST IRON!



NOW...

THREE LINES OF SUPER CARBIDE TIPPED CUTTERS PROVIDE A CUTTER FOR EVERY METAL—EVERY JOB!

In line with its policy of constant development and improvement, Super Tool Company announces a new line of carbide tipped milling cutters designed specifically for use on cast iron, malleable iron, brass, bronze and similar metals.

Now . . . whatever your job, whatever the type of metal you are milling, you will find a Super Carbide Tipped Cutter designed to bring you faster, more efficient, more economical production. For the new cutters mentioned above are in addition to Super's line of general purpose cutters for aluminum, dural, magnesium and plastics and its line of carbide tipped cutters for steel that has established such amazing records of production and economy the country over.

Next time you order milling cutters, step up your production while you step down your costs by specifying Super Carbide Tipped Cutters designed specifically for the work you are doing.

Phone . . . wire . . . write today for complete information on Super Tool's new line of Carbide Tipped Milling Cutters for Cast Iron.

OTHER CARBIDE TOOLS FOR . . .

Turning, Facing, Reaming, Forming, Spot Facing, Boring, Grooving, Drilling, Grinder Rests, Wear Parts, Counterboring, Shaving, Centers and Special Purposes.

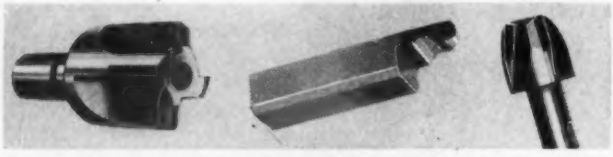
★

SUPER TOOL COMPANY

Carbide Tipped Tools

21650 Hoover Road, Detroit 13, Michigan ★ 4105 San Fernando Road, Glendale 4, California

SAM:—BOSS—I NEED HELP!
BOSS:—HOW COME?
SAM:—CAN'T KEEP UP WITH THE CHIPS—GUESS IT'S THAT A.C.E. CARBIDE CUTTER REMOVES THE STOCK FASTER THAN I CAN.

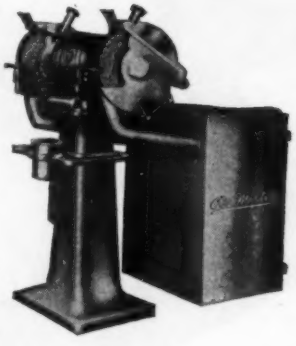


Sam is right—the A.C.E. carbide cutter turns out the work so fast that the chips do pile up. Carbide cutters certainly speed up the cutting. Better look into this—you may be able to speed up your production materially with A.C.E. carbide tipped cutters made specially to suit your requirements.

AMERICAN CUTTER
AND ENGINEERING CORPORATION
31745 MOUND ROAD • WARREN, MICH.

BUY MORE BONDS—HELP CUT DOWN THE JAPS

A.C.E. SPECIAL CUTTING TOOLS
HI-SPEED OR CARBIDE-TIPPED



But who wants to help dust and grit? It's good riddance of bad rubbish. That is why so many AIR-MASTERS are installed at grinders and buffers everywhere. The AIRMASTER sucks up these destroyers of health and machinery right at the moment they fly off the whirling wheels. Employees are no longer forced to inhale harmful dust and grit laden air. The sensitive mechanisms of expensive machinery are protected against destructive abrasive action.

To master dust and grit, install the AIR-MASTER. Fully self-contained—efficient, rugged, dependable. A size for every grinder and buffer. Write for full details.

NOW AVAILABLE—Two, Three and Five H.P. grinders and buffers on AA5 priority or better.

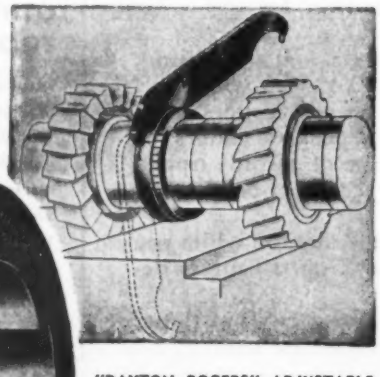
The Cincinnati
ELECTRIC DRILLS • GRINDERS • BUFFERS • PORTABLE TOOLS
The Cincinnati Electrical Tool Co.
DIVISION OF THE R. K. LeBLOND MACHINE TOOL CO. CINCINNATI, OHIO
2615-13 Madison Rd.

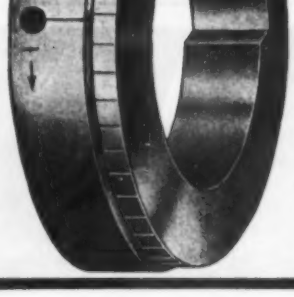
SAVE TIME ON YOUR
GANG MILLING SET-UPS

You are assured FAST—ACCURATE spacing on all side milling cutters and gang milling set-ups with

DAYTON ROGERS ADJUSTABLE SPACING COLLARS

Just loosen cutter arbor nut and make plus or minus adjustment with handy wrench as shown.





"DAYTON ROGERS" ADJUSTABLE SPACING COLLARS are graduated in thousandths, with plus or minus markings as illustrated. A .0005 adjustment can easily be made by visual calibration. These collars are made in 12 standard sizes from ⅞" to 2".

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DAYTON ROGERS MFG. CO.
3306 18th Ave. S. Minneapolis, Minn.

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Dial Gauges and Indicators

Model C

are accurate, reliable and built to stand the gaff of hard usage.

This Model C Dial Indicator has a 2½ in. diameter dial, with 50 or 100 divisions. Can be furnished in graduations of .001-in., .0005 in. or .01 mm. Has a ½-in. range, movable dial easily set at zero.

The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two separate units, so that repairs can be made easily.

There is a R. & S. Gauge for practically every purpose. Write for circulars describing our complete line.

RANDALL & STICKNEY
Waltham 54, Mass., U. S. A.
Makers of Dial Gauges Since 1885

SAVE
Setting-Up Time with

NICHOLSON EXPANDING MANDRELS

Set of 19 of these economy, precision tools does the work of 193 solid arbors. Hardened tool steel. 2 types, all sizes. Sold singly or in sets. Prompt delivery. Bulletin 1043.

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Good gages are the product of good equipment plus the skill of good gage masters in using these tools. Kobe Gages have been produced during these war years to the strictest specifications of our Armed Forces and have played their part in making VE-Day an actuality.

Kobe quality gages will be available in quantity for industrial use shortly after VE-Day. What Kobe Gage masters have learned during the stringent war years will be yours for better meeting the competitive requirements of the important peace years ahead.

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Adjustable

THRIFTMASTER ***Adjustable*** **Drillheads with 2 or more Adjustable Spindles are highly practical machine tools. Descriptive brochure on request.**

High Production - Money Making

MULTIPLE SPINDLE DRILLHEADS

THRIFTMASTER PRODUCTS

Division of

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Get Easier Cutting and Longer Saw-Life

ON MAGNESIUM, ALUMINUM, PLASTICS, HARD WOOD

Soft materials like the light metals, plastics and wood all turn up extra-large chips when cut. So saws used in this type of cutting need extra-large gullets to clear these big chips . . . saws like Simonds Skip-Tooth Band Saws. This type of saw has coarse teeth . . . 2, 3, 4 and 6 per inch . . . yet the gullet is shaped so that even the narrower blades have maximum strength in the body, the teeth only being hardened. So you can bank on it that these new Skip-Tooth Saws will stay sharp so long that you'll get your money out of them long before they dull . . . which means you can economically replace with new blades and cut out all sharpening costs. See your dealer or write direct to Simonds.

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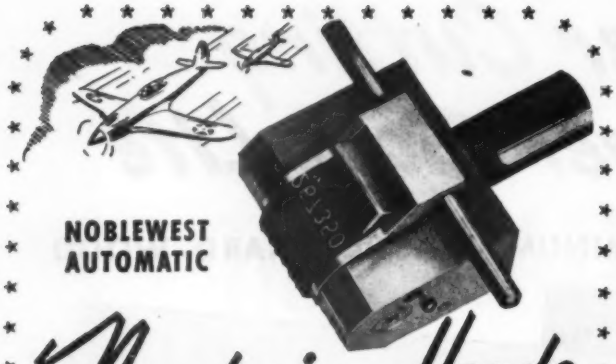
Cut the War Short, BUY WAR BONDS

PRODUCTION TOOLS FOR CUTTING METAL, WOOD, PAPER, PLASTICS

SIMONDS SAW AND STEEL CO.

FITCHBURG, MASSACHUSETTS



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FAST • ACCURATE • DEPENDABLE

Unsurpassed in quality, Noblewest Automatic Numbering Heads can be relied upon to number consecutively with automatic precision. Numbers may be kept constant if desired. Can be used on flat and round surfaces. Choice of number styles and sizes. Write today for details.

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SHORT OVERHANG

and accurate — at all speeds — *because* of short overhang and preloaded ball bearing. Point ground after assembly assures true center point.

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Desmond Hex Dresser

We manufacture a complete line of Dressers and Cutters. Write for copy of catalog "A".

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LOW PRICED

PORTABLE

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READY TO WORK

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. . . for better machining of tough materials—

• Each machining job is different. ThredKut 99 can be used straight or diluted to fit job requirements. Stuart Oil Engineers, "skilled in the art" can adapt this perfectly balanced heavy duty cutting oil to give the results you are looking for. D. A. Stuart Oil Co., Limited, 2729 So. Troy Street, Chicago 23, Illinois.

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SPECIAL CUTTING OIL

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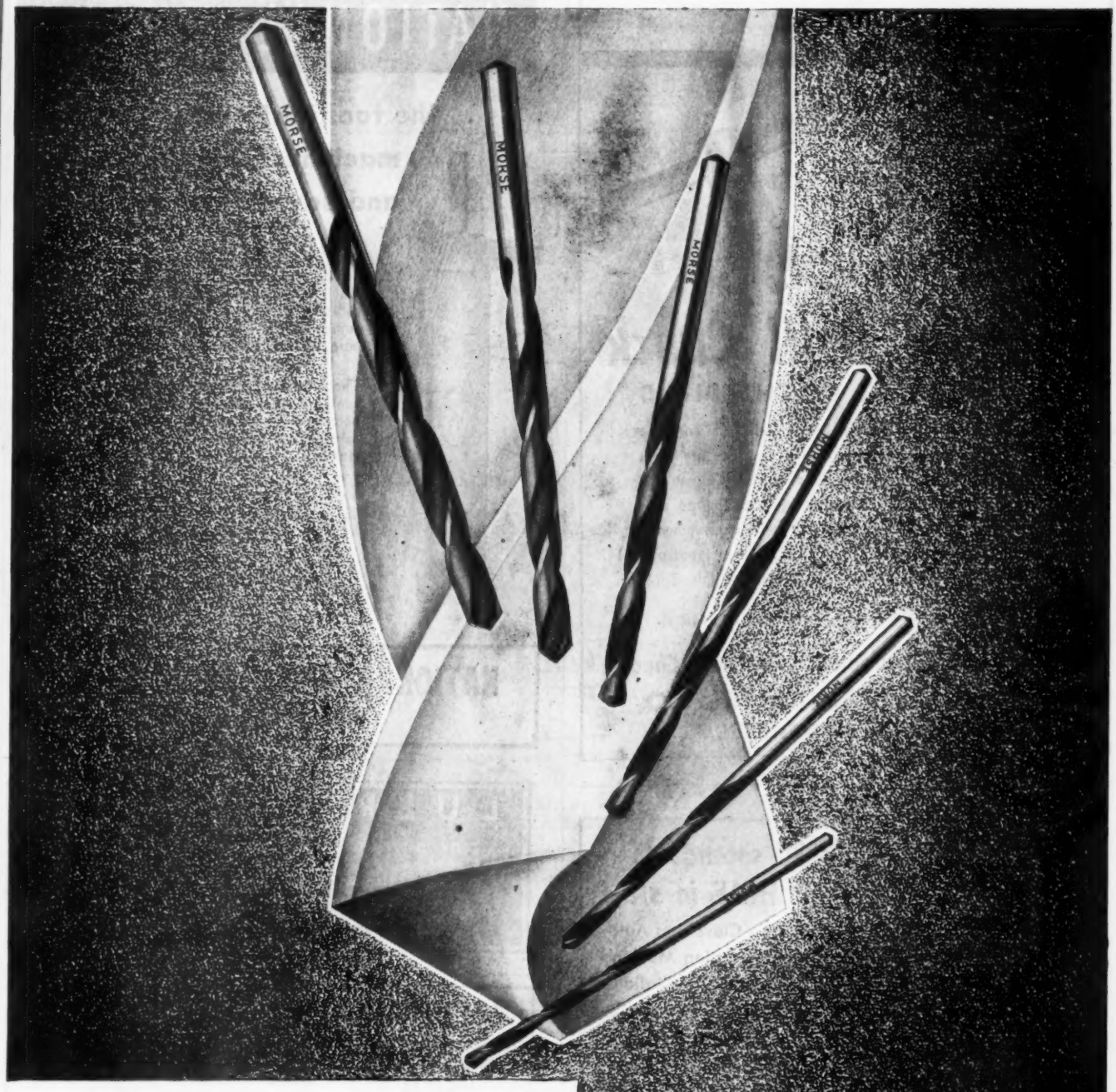
ESTABLISHED 1865

FOR ALL CUTTING FLUID PROBLEMS

Stocks in All Principal Metal Working Centers



IN SMALL DRILLS AND LARGE DRILLS, MORSE QUALITY STANDS FOR PRODUCTION EFFICIENCY... REGARDLESS OF SIZE, YOU CANNOT BUY A BETTER DRILL THAN MORSE

MORSE

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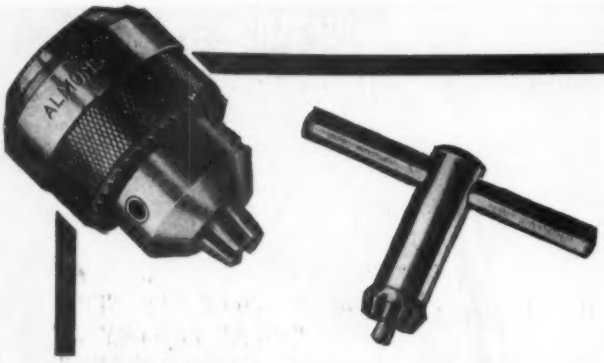

Almond Drill Chuck

THE FIRST IN THE FIELD

ALMOND THREE-JAW DRILL CHUCKS were the first to be placed on the market over Seventy years ago. As Pioneers in the field of Drill Chucks, the name "ALMOND" has long been associated with the logical procedure of machine developments. ALMOND DRILL CHUCKS are made in types and sizes to fit all machine tools and portable drills.

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The Original Manufacturers of Drill Chucks

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. . . the tool that converts drilling machines into key-seaters and saves time and money

● With this modern tool you can handle keyseating jobs not suitable for keyseating machines on any of your drill presses or radials. Keyseats with parallel sides, accurate in depth and in perfect alignment with bore axis are assured.

The National Keyseating Miller mills, keyseats in one cut. It can be used on taper holes, offset holes, blind holes and for taper keys. Work clamping is unnecessary. We also manufacture oil-grooving millers.

Made in twenty-six different diameters from ½" to 3½". Several widths of cutters can be used in each size.

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NATIONAL MACHINE TOOL CO.
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LUERS

Patented Cutting Off Tool Holders
Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured By
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Only 30 seconds to TAP 1¼" HOLE *in steel*

● This Cleveland Automatic Tapping Machine is tapping 1¼" diameter x 2½" deep holes in forged steel turnbuckles at Edward W. Daniel Company. It is tapping these parts 300% faster than previous method—is maintaining accuracy—and increasing tap life. The lead screw control used on this machine steps up tapping speeds—improves thread accuracy—reduces tap wear and breakage. For example—tapping class 3 threads, as many as 10,000 holes have been tapped with a single tap. This performance speaks for itself—for design and construction features—write for full descriptive bulletin.

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HELICAL TAPER PIN REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

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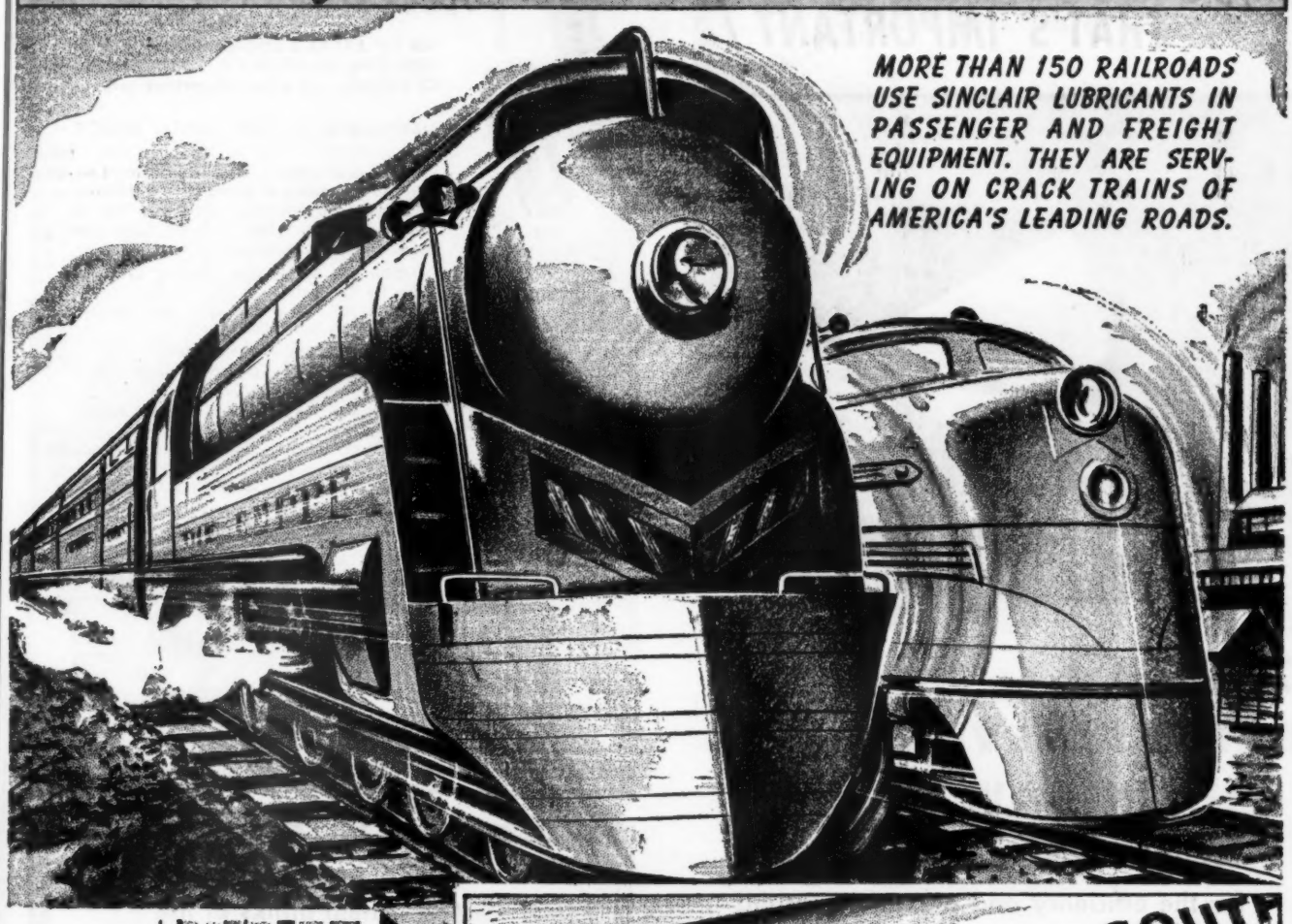

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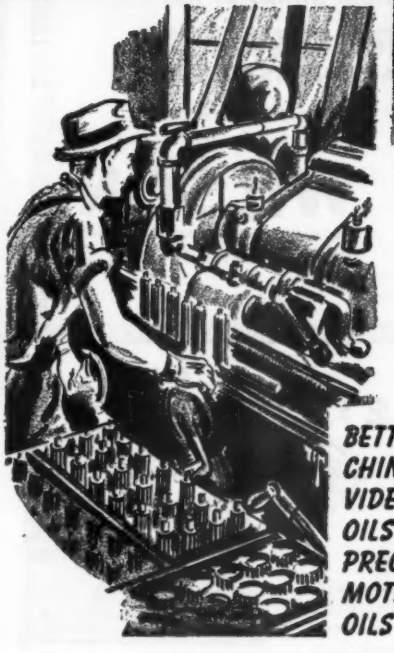

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SINCLAIR IS EQUIPPED TO SERVE YOU BETTER!

FOR FULL INFORMATION OR LUBRICATION COUNSEL · WRITE SINCLAIR REFINING COMPANY, 630 FIFTH AVENUE, NEW YORK 20, N. Y.

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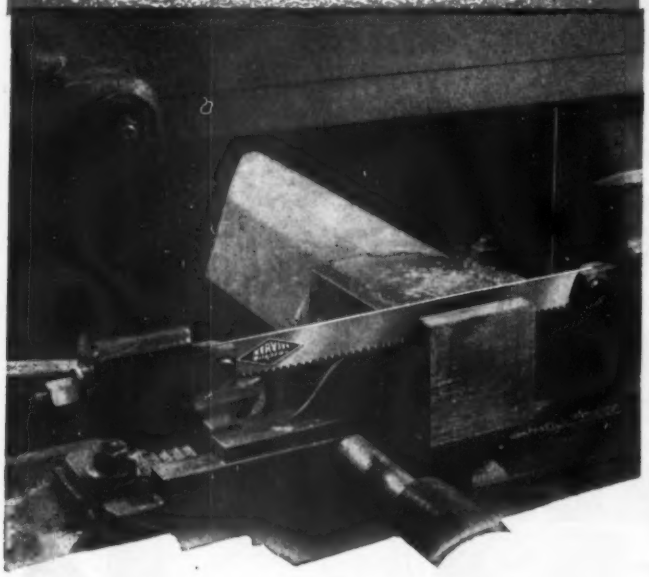
THAT'S IMPORTANT!



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BARNES SERVICE *(Molybdenum)*
HACK SAW BLADES

Yes, it is the blade that really counts—for the efficiency and maximum cutting production of your power hack saw machine depends greatly on your choice of a blade of proven quality and performance.

Barnes Service Power Blades set the pace on high production cutting jobs. They deliver dependable cutting service *longer* and assure efficient machine performance. Reduce *your* cutting costs by using Barnes Service Power Blades.

Your Barnes Distributor carries complete stocks of Barnes Service Power Blades and Barnes Metal Cutting Band Saws, including the new Skip Tooth type. Your order secures prompt delivery.

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Precision Collets

For 10" ATLAS & LOGAN, SOUTH BEND, SHELDON, CRAFTSMAN, POWR-KRAFT, CLAUSING and other important lathes.

IMMEDIATE DELIVERY FROM STOCK

The *Precision* name on a collet is your unconditional guarantee of accuracy in machining, hardening and grinding. Make sure then to specify *Precision* when ordering from your dealer. Literature on request.

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- MODEL 3C: For 8" & 9" South Bend, Clausing, Hardinge No. 3, 10" LeBlond, etc.
- MODEL 1A: For 8" & 9" South Bend.
- MODEL 5C: For 9", 10", 16", 18" South Bend, 1" capacity Sheldon, Schauer, Sebastian, etc.
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- MODEL 480: For Logan Screw Machine, Turret Lathe and attachments; Warner & Swasey No. 1, etc.
- BREN Collet: For Handwheel & Lever-Type Speedichuk.

KLUTCH - KOLLET (Step Chuck) for chucking work to 2¾" diameter with collet accuracy. Head unhardened for easy boring. Fits 3AT, 3C, 1A adapters only. List unbored $7.50 each.

• 5C KLUTCH-KOLLET NOW READY. List unbored $10.50.

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"ROCKWELL" HARDNESS TESTER

Now and always made only by

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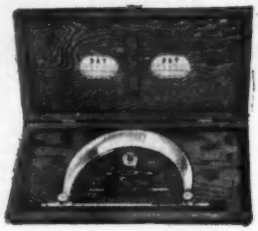
D&T MICROMETERS AND SNAP GAGES

Tubular welded frames with forged ends insure a maximum of accuracy with a minimum of weight.

There are a variety of types available with either micrometer heads or dial indicators to cover a range of capacities from 0 to 168 in. . . . *Write for Bulletin 200* or outline your gaging problems.



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Mfrs. of Machine Tools and Micrometers
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FAST, EFFECTIVE RUST REMOVAL BY *Surface Chemistry**

Above: CLUTCH PLATE

★ TURCO W. O. #1, through Surface Chemistry,* minimizes pre-cleaning and makes neutralizing treatment unnecessary. One continuous operation reconditions metals, passivates surface, prepares it for durable rust-proofing or painting.

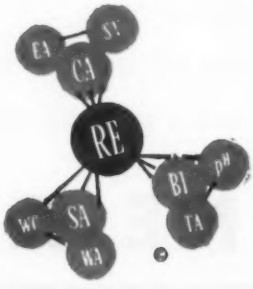
Contains no abrasives, requires neither scouring nor sanding. A short dip in Turco W. O. #1, or a brief wiping makes rust disappear. The wetting properties of Turco W. O. #1 enable it to penetrate screw threads, grooves and crevices which could not be reached any other way.

W.O. #1 wets out and removes minor soil deposits. It it not hindered by presence of light oil film. Unless work is heavily soiled, pre-cleaning is unnecessary.

W. O. #1 deposits an absorbent phosphate film on the surface of the work which bonds tenaciously with primer, paint and rust-proofing compounds.

A W. O. #1 treated surface is therefore not only clean and free of rust, but ready immediately for final processing. One trial will prove it.

Write for full particulars about Turco W. O. #1, another Turco development in *Surface Chemistry.**



*What SURFACE CHEMISTRY is:
WA–Wetting Action
EA–Emulsifying Action
SV–Saponifying Value
SA–Solvent Action
CA–Colloidal Activity
WC–Water Conditioning
BI–Buffer Index
pH–Energy of Alkalinity
TA–Total Alkalinity
RE–Research and Experience

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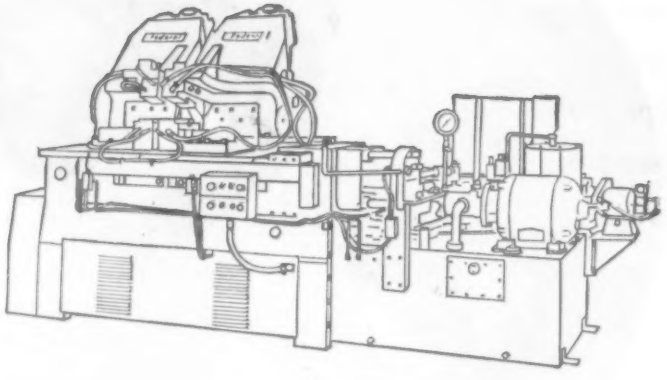
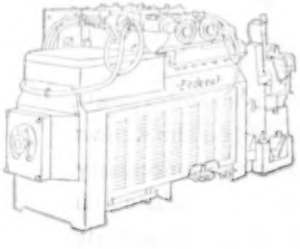
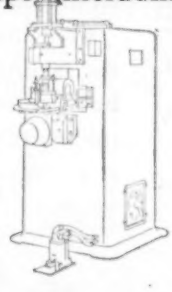
For Fabrication of Metal
Resistance Welding Downs
Ups Production . . .



The Federal Machine and Welder Company offers the metal working industry increased efficiency in production through resistance welding.

Federal makes all types of resistance welders: for example, heavy duty units typified by the 1000 KVA butt flash welder sketched at right, are made to weld heavy steel rings up to seven feet in diameter. These welders produce high quality forged welds in cross sections up to 18 square inches of high carbon steel, greater areas of mild steel. Similar jobs might be large ring gear blanks, rotating platform bearings, perhaps locomotive tires . . . Sash welders, such as sketched at left, speed production on steel sash of all kinds, are typical of the smaller butt and flash welders adaptable to everything from table knives (stainless welded to mild steel) and tools (high carbons to mild), to all kinds of metal tubing, rods and strips (including copper to aluminum in special instances), with either automatic or hand operation . . . Press type welders, amazingly versatile units for all kinds of projection welding, can be adapted by die changes to an infinite variety of fast assembly of metal parts. One suggested in the right hand corner of this page welds handles to pots and pans of enameling steel (adaptable for aluminum) and in actual production has cut costs to one-fifth that of previous method . . . And, speaking of versatility, one of the most useful tools in metal fabrication is the





THE FEDERAL MACHINE AND W

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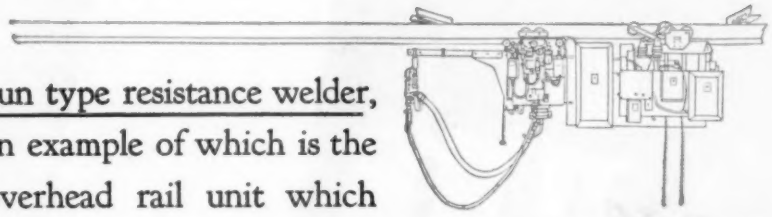
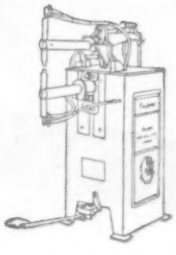
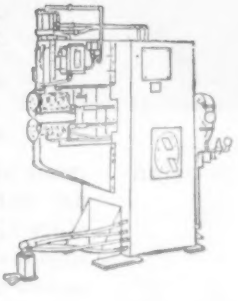


gun type resistance welder, an example of which is the overhead rail unit which can be rolled up and down an assembly line and allows operator a wide radius of travel about the work (see above)... Spot welders, from small utility rocker arm types (see left) to heavy duty units capable of welding sheets up to ⅜ inch each have wide use in the metal working industry ... Roll spot and seam welders have equally broad application, produce a continuous or intermittent weld, automatically indexed... and many other cost saving types.



Federal wants to make available to you full information on applications of resistance welding to better and faster fabrication. We want to bring you up to date on resistance welding as a tool for modern production. Federal is ready to help if you will tell us WHAT YOU WANT TO KNOW ABOUT RESISTANCE WELDING.



Consult "the name of authority on resistance welding".

Federal

D WELDER CO. 230 Dana Street WARREN, OHIO

VERSATILE MODERN PRODUCTION TOOLS

BARREL WELDERS

Of the millions of welded steel drums or barrels used to distribute gasoline and oil to our mechanized war in far corners of the earth, a vast majority are welded on Federal Barrel Welders. Not only has a major percentage of the industry for many years been equipped with Federals, but The Federal Machine and Welder Company designed and built several complete barrel manufacturing plants set up by the army at distant bases to augment the tremendously increased output of the home industry.

Seam welds (resistance welded) in such containers must be able to take terrific punishment. Immediately after welding, the barrel shells pass through a machine which forms two rolling rings in the side, by stretching the steel outwardly under great pressure. Then, too, the loaded barrels, weighing over four hundred pounds, often are dropped a distance that subjects them to thousands of pounds impact. The weld must hold.

NEW FOLDERS

Most recent informative bulletins on Federal Resistance Welders to come from the press are the new "Type R" bulletin describing a complete line of rocker arm utility spot welders . . . and "Type P" Bulletin with details of Federal's Press Welders, used for projection welding, mash welding, etc. Bulletins are available now on request.

HOUSEWARE PRODUCTION

Anticipated expansion of houseware production points up the advantages of Federal resistance welding for the fast, low cost application of handles to enameling steel or aluminum pots and pans. Press type welders are used, with dies that permit rapid loading, give production of 500 to 800 handles per hour, depending upon type of handle applied. Cost with one manufacturer is one-fifth previous methods.

INTERESTING PLANT

Full details of a complete manufacturing plant for high production of large resistance welded tank turret rings (up to seven feet OD) are in a book just released by The Federal Machine and Welder Company. The company designed and built the entire plant, shipped to a foreign power. Point of interest is that similar rings, which can be made with same equipment, could be used for large ring gear blanks, rotating table bearings, possibly locomotive tires. Limited number available to executives, technical men, sufficiently interested to write to Federal giving name, official title and company name.

THIS LINDBERG BRAZING FURNACE GIVES YOU 6 in 1

Furnaces

You can use this new completely engineered furnace for:

1 High temperature copper brazing
2 Low temperature silver brazing
3 Sintering of powder metals
4 General tool hardening
5 High speed tool hardening
6 Bright annealing

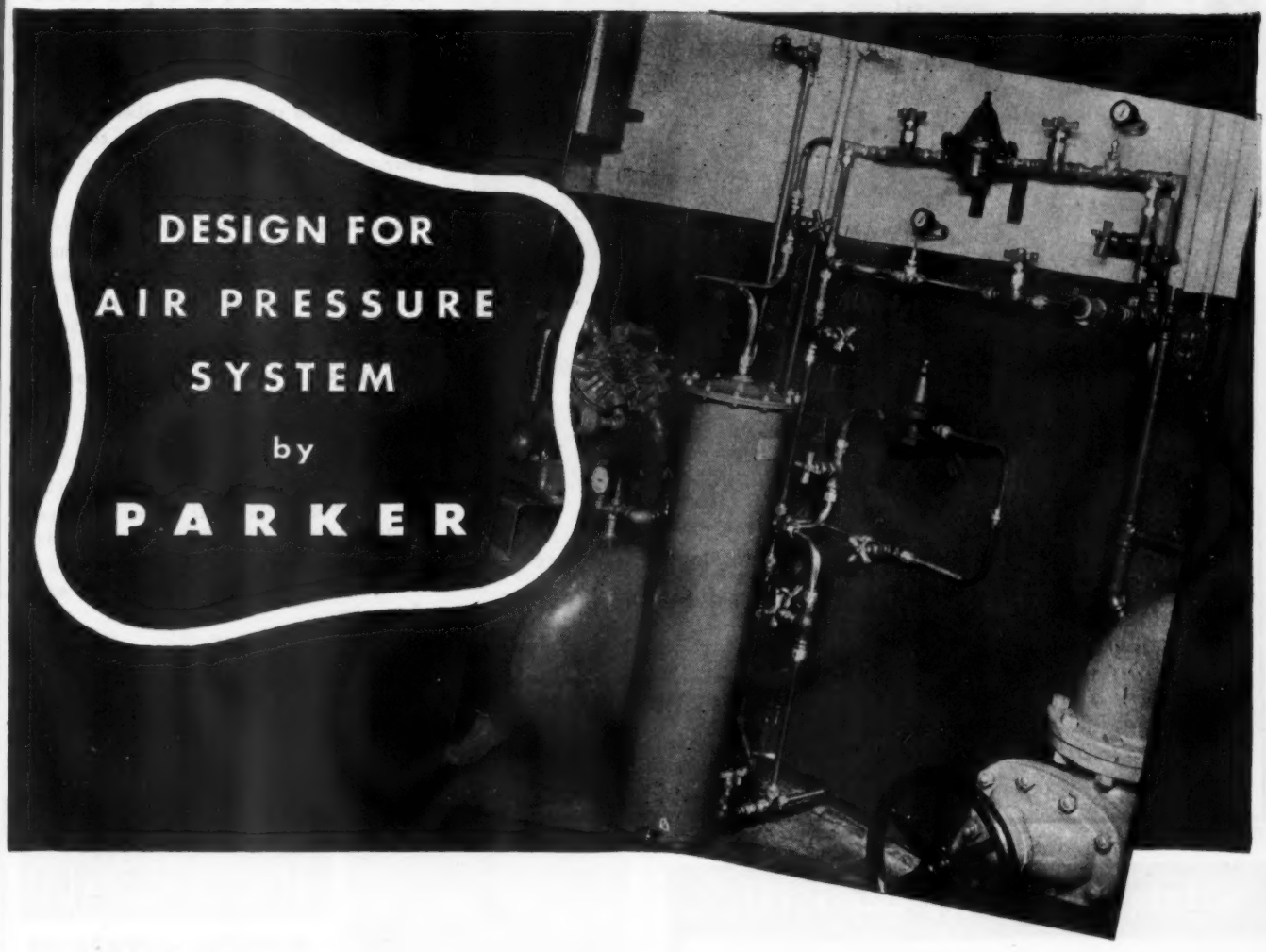
Keep it as busy as you can with brazing, but if your brazing production is irregular this furnace offers ideal facilities for any other heat treating operation requiring a protective atmosphere. A mid-west manufacturer, for example, hardens the dies used for forming the parts to be brazed.

Globar elements develop a temperature up to 2500° F. At copper brazing temperatures of 2050° F., the Globar elements are not forced to their full heating capacity and the additional degrees up to 2500° F. allow plenty of range in which to heat any of the high speed tool steels for hardening and also for sintering certain powder metals. These non-metallic elements are easily replaced in a few minutes without cooling down the furnace, virtually eliminating production delays. A choice of protective atmospheres allows treatment of any kind of steel.

Find out all about this versatile hand-pusher type furnace. Write now for bulletin 200. Lindberg Engineering Company, 2445 W. Hubbard Street, Chicago 12, Illinois.

LINDBERG *Furnaces*

SUPER-CYCLONE • CYCLONE • HYDRYZING • BRAZING



Let's take a frank look at the things that make the controls work—on this air pressure system or on *your* machines.

Here are the specifications for the kind of tubing system that sound Fluid Power Engineering calls for:

Streamlined Flow—for minimum pressure drop, freedom from obstructions and minimum demand on power source.

Space Saving—making best possible use of available space.

Easy Accessibility—for quick and inexpensive service and maintenance.

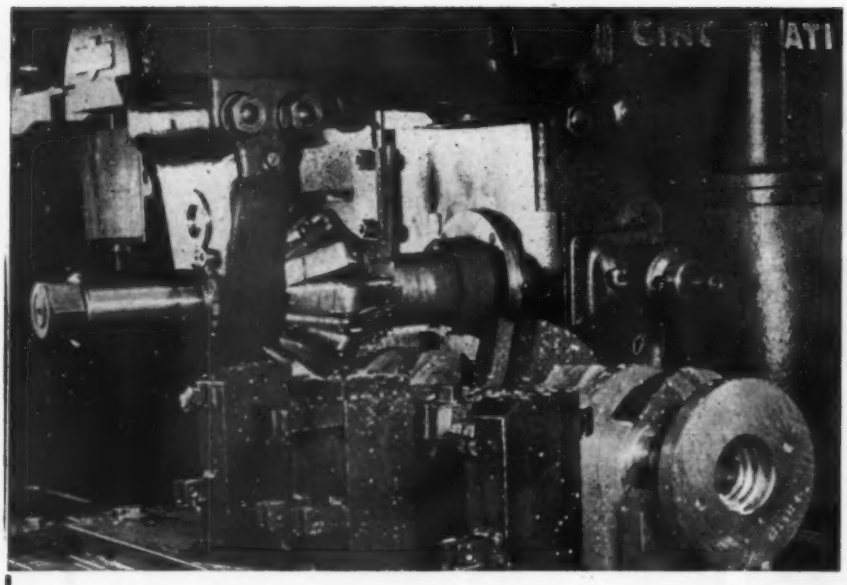
Fewer Joints and Connections—for greater protection against the possibility of leaks, even under conditions of severe vibration, high pressures and abuse.

Parker Fluid Power engineers, for more than twenty years, have been designing these systems — for aircraft, motor vehicles, machine tools, refrigeration and process equipment.

We've been building the valves and fittings and the fabricated tubing, for Fluid Power installations, and for fluid transmission.

Whatever you make or plan to make, this broad experience is yours to command. Consult with a Parker engineer, especially in the planning stage. For this service, or for more information, write to The Parker Appliance Co., 17325 Euclid Ave., Cleveland 12, Ohio.

PARKER



From Blueprint to Product

The illustration shows a form relieved milling cutter gang, which is used in milling cast steel alloy crankshafts for the 500 H.P. Ford eight cylinder tank engine.

The crankshaft which has a Brinell hardness of 255 to 286 is milled in a Cincinnati-Hydromatic Mill 45 x 48. The operation shown, which is made in one cut, is the milling of the profile of crank checks and counterweights in one setting. The operation consists of eight separate cuts of approximately 11" face area x 1⅜" wide.

The cutter operates at 40 R.P.M. with a feed of 1" to 1½" per minute. The cut varies from ⅛" to ½" deep. The production per machine is 1 to 1.2 shafts per hour or nine shafts per machine in eight hours. A soap water solution is used as a coolant. From nine to sixteen shafts per tool are milled with each sharpening.

NATIONAL TOOL PRODUCTS

BROACHES • HERRINGBONE CUTTERS
SLITTING SAWS • COUNTERBORES
REAMERS • GEAR SHAPER CUTTERS
GEAR CUTTERS • MILLING CUTTERS
CIRCULAR AND FLAT FORM TOOLS
HOBS, GROUND AND UNGROUND
SPECIAL TOOLS

National Tools are the shapers of Progress

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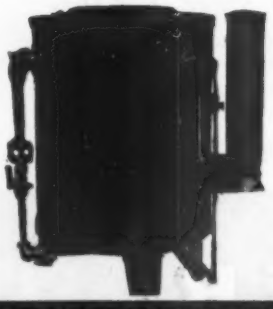
11200 MADISON AVENUE CLEVELAND, OHIO

"BUZZER" HIGH SPEED *Gas* FURNACES

2400 F.°

Attained quickly with "Buzzer" Full Muffle Furnaces designed primarily for heat treating high carbon and alloy steels.

NO BLOWER or POWER NECESSARY
. . . just connect to gas supply

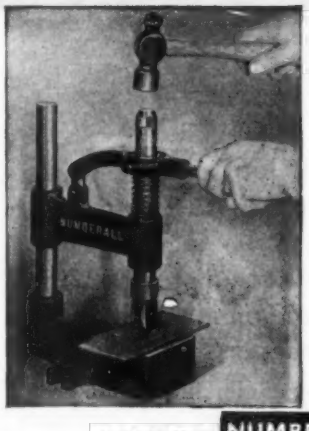


"BUZZER" Atmospheric Pot Hardening Furnaces assure even heat up to 1650° F.

Used for Salt, Cyanide and Lead Hardening. Also adapted for Melting Aluminum.

Send for the complete "BUZZER" catalog today.

CHARLES A. HONES, INC.
121 So. Grand Ave. Baldwin, L. I., N. Y.



NUMBERALL

MARKING APPARATUS
Model 47

For Stamping Letters and Figures, etc., upon Metal, Wood, etc.

Facilitates the MARKINGS of a great variety of Parts and Plates such as Bushings, Gears, Name Plates, etc.

Can be carried where it is needed.

A variety of marking stamps and numbering heads can be used with this press.

On small size letters and figures the hammer can be dispensed with.

Write for Bulletin AM47.

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HARDNESS TESTER

Let the SCLEROSCOPE speed up the production of that s so we can blow the Axis to HELL

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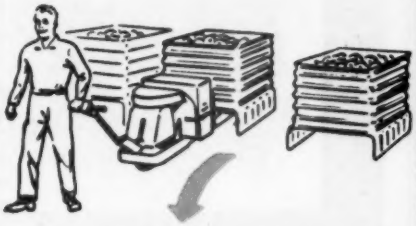
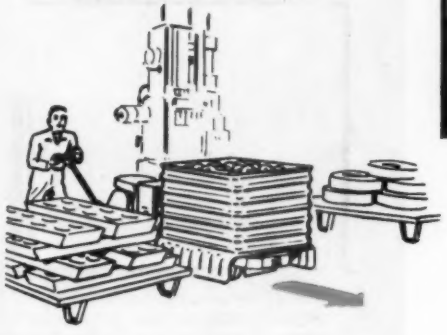
Tons transported all along the production line speedily and only - - - - - - -

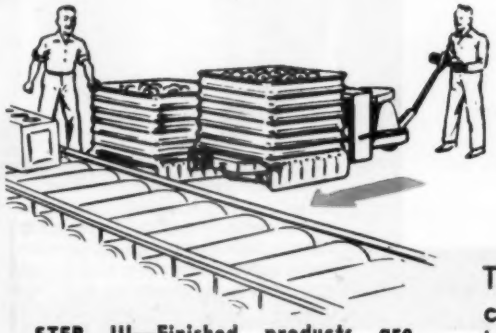
ONE TRUCKER NEEDED



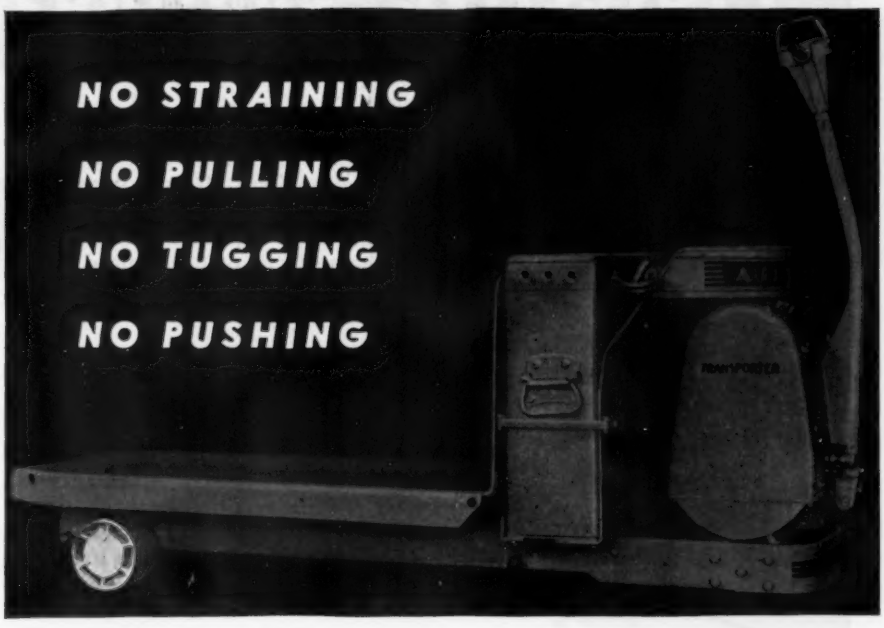
STEP I—Skid loads from production are quickly dispatched using one man or woman with "TRANSPORTER."



STEP II—Assembly machines 10 to 25 feet apart are easily served by using "TRANSPORTER." Narrow aisles can be readily maneuvered.



STEP III—Finished products are quickly moved from assembly to final packing marking and strapping line with "TRANSPORTER" operations.



TRANSPORTER
PLATFORM LIFT TRUCKS

★ **Results: Reports show 100 to 500 tons of material per day can be easily handled and dispatched by using one man or woman with "TRANSPORTER."**

The "TRANSPORTER" is easy and safe to operate with thumb tip controls in steering handle for safe walking speeds. Electric motor is powered by heavy duty battery and mechanically drives front wheel at any steering angle. Brake is mechanical and positive with automatic emergency control. Lift has shockless hydraulic operation with easy foot lever controls.

This lift truck is designed to serve all industry for economical and safe lifting—spotting, and short hauling of various loads of raw materials and finished products on skid platforms up to 6000 lbs. and on pallets up to 4000 lbs.

Write for Bulletin No. 8

MANUFACTURERS FOR OVER 38 YEARS *Electric Propelled* INDUSTRIAL TRUCKS

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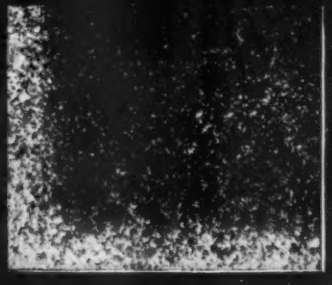
MEMBER OF ELECTRIC INDUSTRIAL TRUCK ASSN.
208 South La Salle St., Chicago, Ill.

AUTOMATIC TRANSPORTATION CO.
59 WEST 87th STREET CHICAGO 20, ILL.
Division of the Yale & Towne Manufacturing Company

You Should Know About Park Protective Coatings for Steel

NO-CARB

For the prevention of carburization or decarburization. Applied by brushing or spraying on clean metal surfaces. It is not recommended for threaded work nor is it designed for use in salt baths. Especially suitable for protecting the surfaces of high speed steel tools hardened from furnaces with or without atmospheric control.



Sample of carburized SAE 1015 steel, treated on top and right hand edges to prevent carburization, as compared with untreated edges.

NO-KASE

For selective carburization in liquid baths. Provides positive protection against carburization on areas that have been brushed or sprayed with it. Particularly advantageous where such difficult sections as threads are to be protected against liquid carburization. Can also be used successfully in gas or compound carburizing.

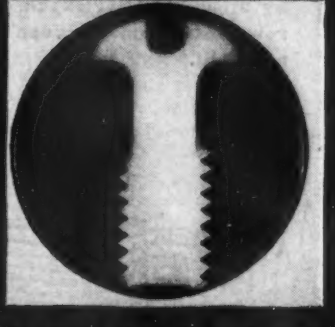
Sample of Molybdenum high speed steel, hardened after treatment of top and left hand edges with NO-CARB while other two edges are unprotected.

NO-TRIDE

For selective nitriding in ammonia atmospheres. An easy to mix, quick drying liquid paint; easily removed after nitriding by wiping or brushing.

NO-SCALE

For the prevention of excessive scaling on steel. A paste of brushing consistency for use on high alloy steels, die blocks and forgings. Acts as a die lubricant and prevents the loss of valuable alloys during heating operations. It is also used on the outside of pressed steel pots to prevent excessive oxidation. May be brushed or sprayed. Removed by mechanical working.



An example of selective carburization with NO-KASE. Note the clear cut line of demarcation between the protected and unprotected areas (treated in PARK-KASE for 3 hours at 1600 deg. F.)

CARBON PREVENTER

For the prevention of carbon penetration into steel. Used on threaded sections or other locations where No-Carb would be difficult to apply or remove. Not designed for use in salt baths.

Park

Liquid and Solid Carburizers • Cyanide, Neutral and High Speed Steel Salts • Coke Lead Pot Carbon • Charcoal • No Carb • Carbon Preventer • Quenching and Tempering Oils • Drawing Salts • Metal Cleaners • Kold-Grip Polishing Wheel Cement

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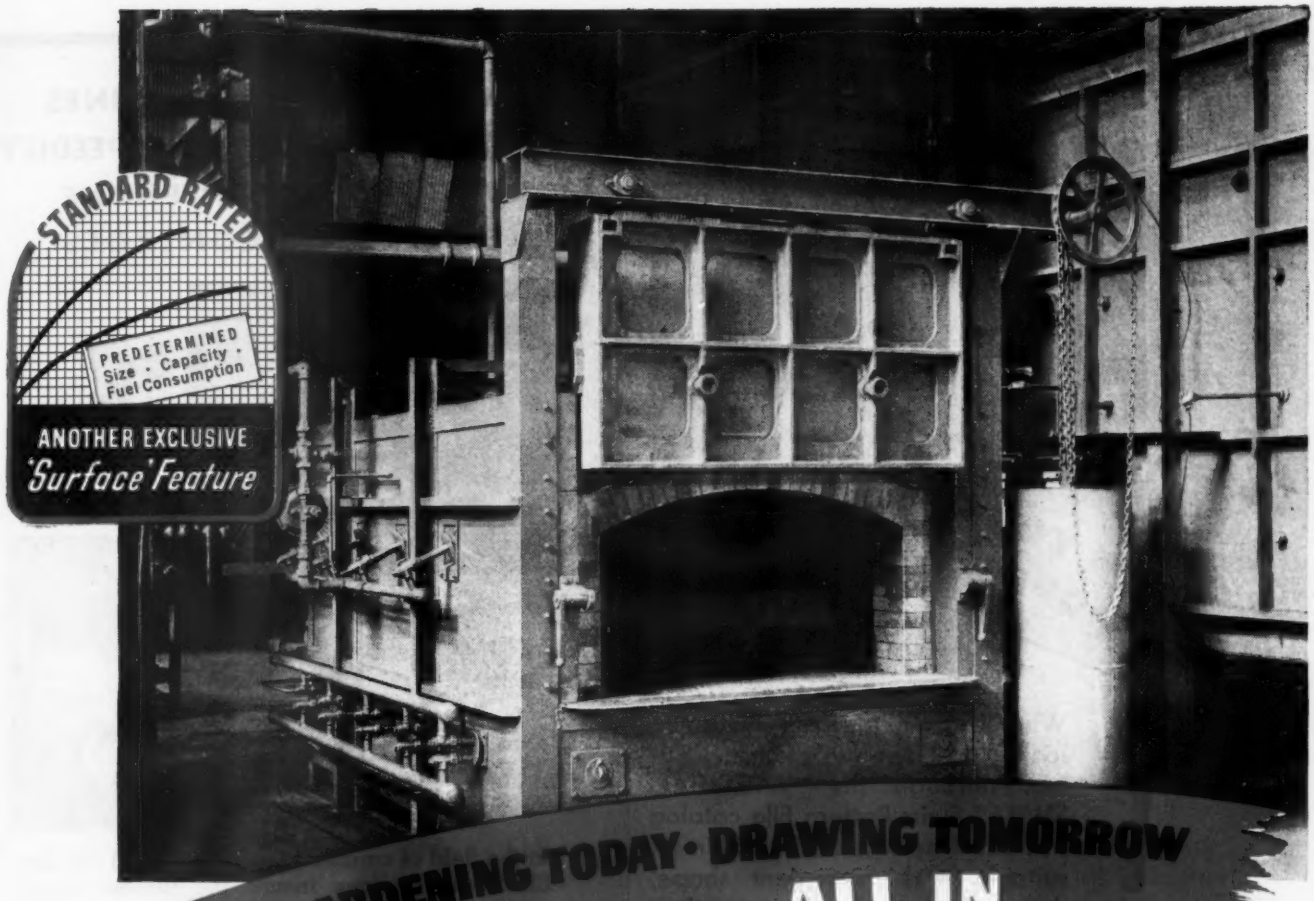
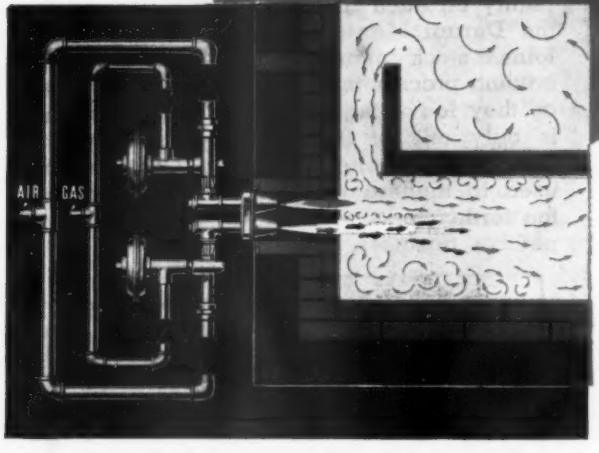


HARDENING TODAY · DRAWING TOMORROW ALL IN ONE FURNACE



That's versatility for you—in a Surface Combustion Standard Rated Oven Furnace. With Conjecto firing this Large Oven has a wide temperature range from 600 to 1800° F. that will fit into your present and postwar heat treating requirements whether it is for annealing, bluing, carburizing, drawing, hardening or normalizing.

Ask for descriptive literature on 'Surface' Standard Rated Large Oven furnaces.

'SURFACE' CONJECTO FIRING

. . . is accomplished by the use of twin nozzle burners, one nozzle located vertically above the other, with two or more sets of burners incorporated in a single casting. The lower nozzles are manifolded to one inspirator and the upper nozzles to another. For temperatures under 1000° F., one set operates with usual correct air-gas ratio and the other set with gas valve closed and air valve open to provide additional circulation of hot gases and more uniform heating.

For temperatures above 1000° F.—both sets operate in usual manner with proper air-gas ratio.

'Surface'

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STANDARD AND SPECIAL INDUSTRIAL FURNACE EQUIPMENT FOR:
Forging, Normalizing, Annealing, Hardening, Drawing (Direct-fired and Convection), Carburizing, Nitriding and Heating. Special Atmosphere Generators.
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Whenever an intricate filing job looks particularly difficult, just look through the "AMERICAN SWISS" Swiss-Pattern File catalog . . . you'll be sure to find the most suitable and convenient shape, size and cut among the more than 3000 files which are listed.

And these precision tools also assure speediest, most accurate, most economical filing operations, too, because of their extra long filing surface, with clean sharp teeth of uniform hardness. Users report that "AMERICAN SWISS" Files save time and money because of their convenience and high quality. If you do not have a copy of the "AMERICAN SWISS" File catalog, be sure to write today, so you can make a selection for trial on your percision and intricate filing jobs. Our local Distributor will be glad to supply you.

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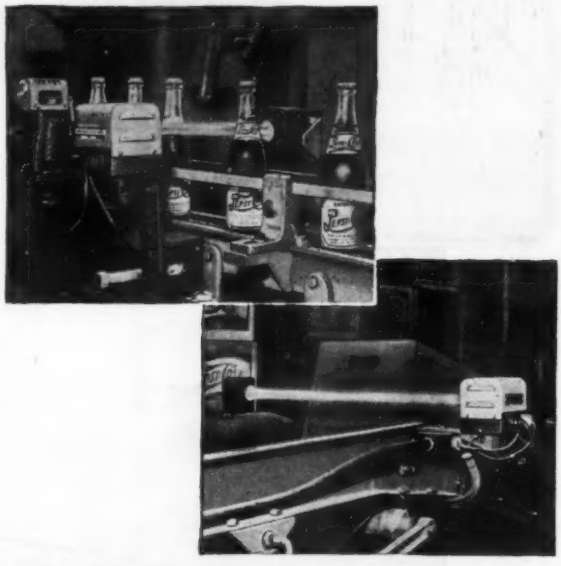
SWISS PATTERN FILES

HOW *Durant* MACHINES COUNT ACCURATELY AND SPEEDILY WITH UNITED CINEPHONE ELECTRONIC CONTROLS



In the field of counting mass-produced articles Electronic devices insure the utmost accuracy, reliability, and economy. In the business of bottling, where profits are a fraction of a penny on each unit, the system devised by the Durant Manufacturing Company maintains a stock count at all times from the initial bottling process through a count of the cases as they leave the factory for shipment. This is only one of the many ways in which United Cinephone Electronic Controls are used in modern production; a necessity in the forthcoming postwar era of highly competitive business.

OTHER APPLICATIONS of United Cinephone Electronic Controls are almost without limit. If you have a problem of measuring, gauging, counting, sorting, heating, or some other operation in your plant, which is costly and unreliable, you will want to investigate the possibility of solving the problem ELECTRONICALLY. That's where our extensive experience and facilities in Electronic design, engineering, and manufacturing can be of invaluable help. Your inquiry will be welcome.

Electronic fields we cover include:

1. **Industrial Controls**
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UNITED CINEPHONE CORPORATION

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ADJUSTABLE LIMIT SNAP GAGES

All sizes to 11⅝" now available from stock

They're speeding inspection in hundreds of plants, dependably, with quickly trained help. Close and accurate inspection, even at close limits is a rapid routine matter with Atlantic Snap Gages.

Made in full accordance with American Gage Design standards. Frames of Meehanite for non-warping rigidity. Gaging pins and anvils of hardened steel, lapped to most rigid standards for flatness and parallelism. Model A has round pins—Model C has solid anvil, often used to gage to a shoulder.

Shipped unset and unsealed, or set to your specifications and sealed. Now ready for quick shipment in all sizes to 11⅝". Order today.

GAGE BLOCKS Set your gages with the Scherr Ultra-Chex gage block set, giving 80,000 combinations in steps of 1/10,000. Price $125.00.

THE SCHERR TOOL STAND holds snap gage in place, leaving both hands of inspection free to speed up the job. Where gage is used continuously, avoids transmission of bodily heat to the gage. Price, $7.50.

MODEL A

RANGE (in inches)	PRICE
0 – ½"	$ 9.50
½–1"	10.00
1 –1½"	10.50
1½–2"	11.00
2 –2½"	11.50
2½–3"	12.00
3 –3¾"	13.00
3¾–4½"	14.00
4½–5¼"	15.00
5¼"–6"	16.00

MODEL C

RANGE (in inches)	PRICE
0 – ¼"	$10.80
¼ – ½"	11.50
½ – ¾"	11.50
¾ –1"	12.00
1 –1¼"	12.00
1¼ –1½"	12.50
1½ –1¾"	12.50
1¾ –2"	13.50
2 –2¼"	13.50
2¼ –2½"	14.00
2½ –2¾"	14.00
2¾ –3 1/16"	15.00
3 1/16 –3 3/16"	15.00
3 3/16 –3 13/16"	16.00
3 13/16–4 3/16"	16.00
4 3/16 –4 9/16"	17.00
4 9/16 –4 15/16"	17.00
4 15/16–5 5/16"	19.00
5 5/16 –5 11/16"	19.00

Complete Price List and Discount Schedule on Request

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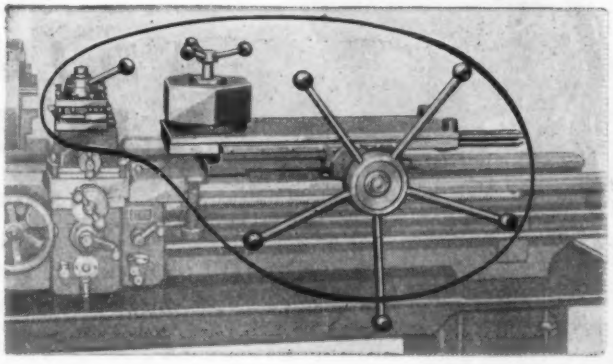
Puts Idle or Unproductive Lathes Back Into FULL-CAPACITY PRODUCTION AT ONCE

● No delays, no tedious overhauling—your turret lathes and screw machines can be completely reconditioned without going out of your plant—and full-scale production resumed immediately. Simply mount LYNN Bed Turret units on your machines, replacing worn or inaccurate turret parts. These finely machined and perfectly fitting units provide you with the equivalent of NEW TURRET LATHES in capacity, accuracy, speed and wide range of operations.

LYNN turret units can also be used to convert engine lathes to turret lathe work.

We manufacture a complete line of Self-Indexing Bed Turrets, Tool Post Turrets, Cut-off Cross Slides, and other equipment for every make and size of lathe. Also Steel Lathe Legs and Splash Pans for Coolant.

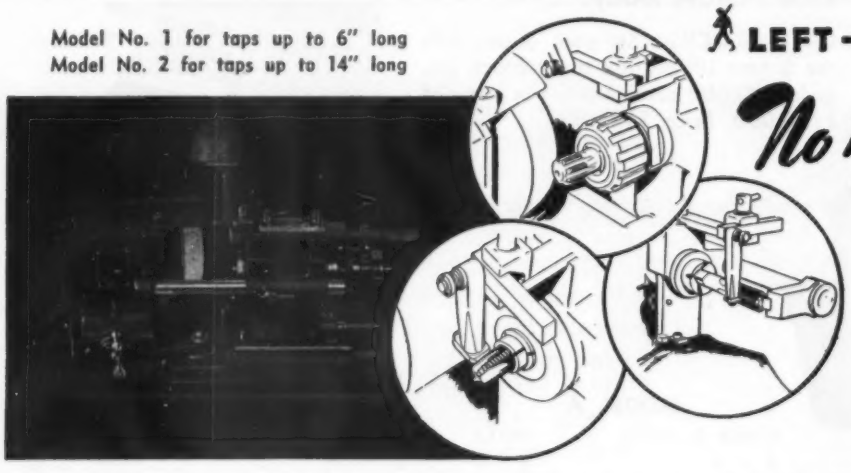


The lathe above has been reconditioned with a LYNN BT-3—Self-Indexing Bed Turret and a LYNN Precision Tool Post Turret. The Bed Turret has 9½" hex head, 6 positions, 10" turret travel, automatic index. The turret base is machined at factory to fit the particular make of lathe on which it is to be mounted.

WRITE OR WIRE FOR COMPLETE DETAILS . . . OR SEE YOUR JOBBER

LYNN MANUFACTURING COMPANY, 224 Elroy St., Minneapolis 8, Minnesota

Model No. 1 for taps up to 6" long
Model No. 2 for taps up to 14" long



LEFT-RIGHT LEFT-RIGHT

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The fact that you can sharpen left- or right-hand taps on any Blake Tap Grinder (without changing over the machine) is a definite production and cost-saving feature. All the operator need do in changing from one type to another is to set one dial and turn the locating finger—it's as simple as that!

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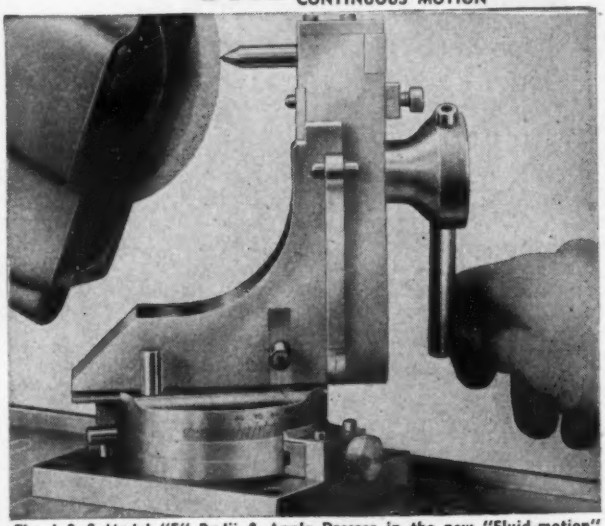

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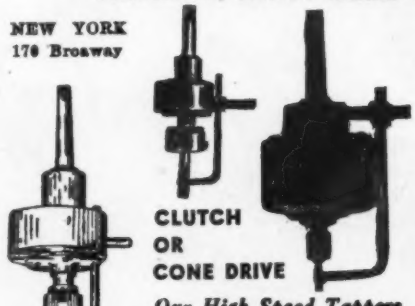

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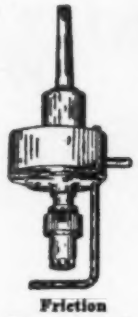
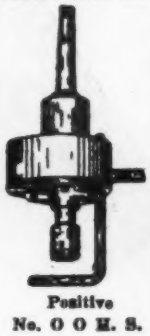


Friction No. 0 0 C. S.



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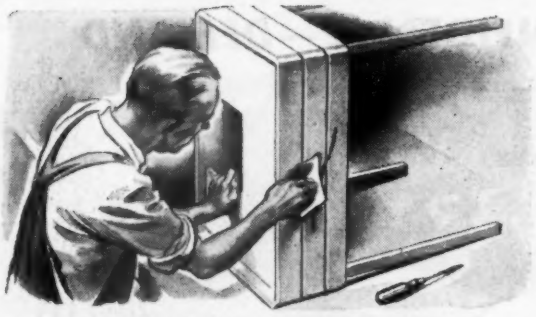
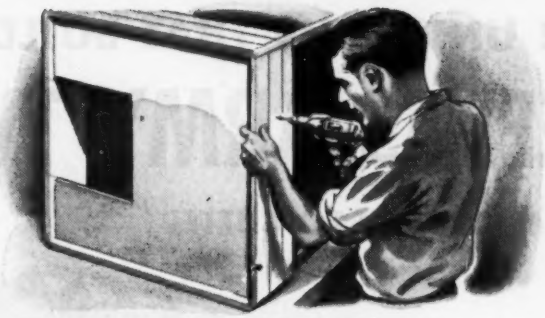
Style D-E with Quick-Change Tool Holders to Drill, Tap and Set studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustment in each tap-holder. If required. **Also, Opening Die-Heads; Opening Stud-Setters; Friction Screw-Drivers and Nut-Setters, etc.**



SHUTS OUT SLIP-UPS!

Assembling baby furniture was mighty slow work with slotted screws, one manufacturer found. Too many scratches to refinish – scratches caused by driver skids. So to pick up production he switched to Phillips Screws...



FRIENDLY TO PROFITS!

... out went burred heads and driver skids and slant driven screws. Out went slow-as-molasses hand driving. In came power driving – and with it, savings in time and materials that sliced a big chunk off assembly costs.

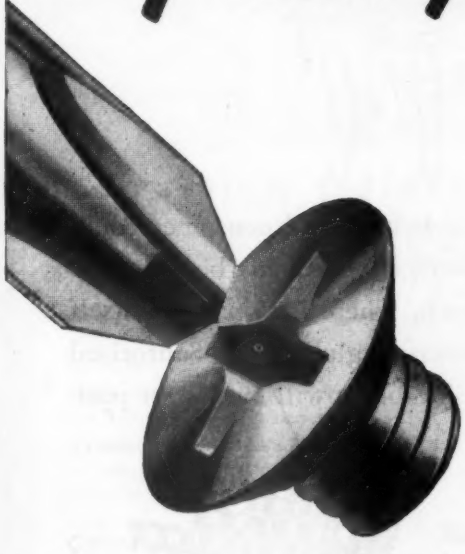
LONG ON SAFETY!

By making it stronger and more rigid, and by banishing dangerous burrs, Phillips Screws made this furniture safer for the kids. And your designers will find they do the same things for your product – whether it's tiny as a hearing aid or hefty as a harvester!

TOUGH ON COMPETITION!

Because of the ornamental design of the recess, Phillips Recessed Head Screws impart a "quality look" to any product. They give you a burr-free, blemish-free job that tells prospects you're on *your* toes – and warns competitors to watch out for *theirs!*

It's Phillips ... the engineered recess!



In the Phillips Recess, mechanical principles are so correctly applied that every angle, plane, and dimension contributes fully to screw-driving efficiency.

... It's the exact pitch of the angles that eliminates driver skids.

... It's the engineered design of the 16 planes that makes it easy to apply full turning power – without reaming.

... It's the "just-right" depth of recess that enables Phillips Screw Heads to take heaviest driving pressures.

With such precise engineering, is it any wonder that Phillips Screws speed driving as much as 50% – cut costs correspondingly?

To give workers a chance to do their best, give them faster, easier-driving Phillips Recessed Head Screws. Plan Phillips Screws into your product now.

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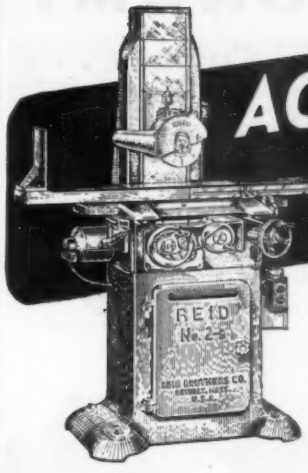

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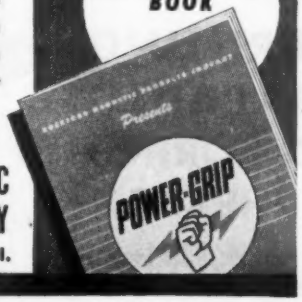

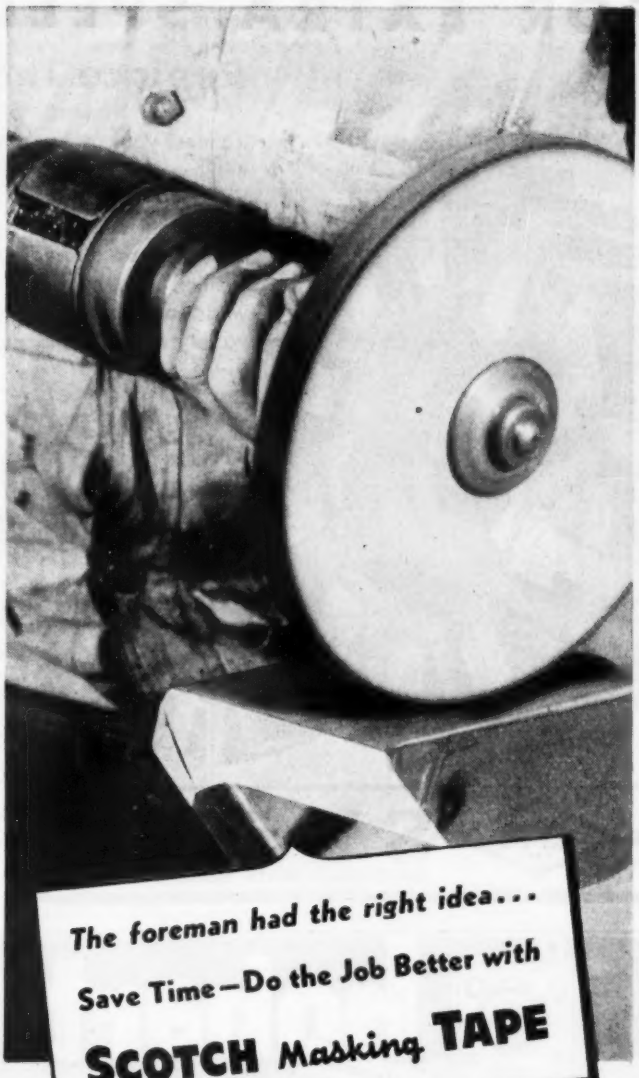

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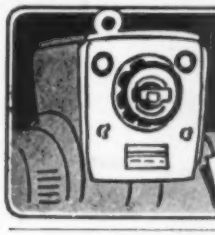

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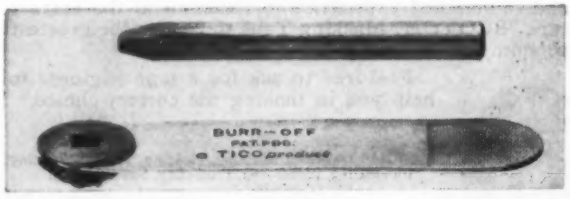

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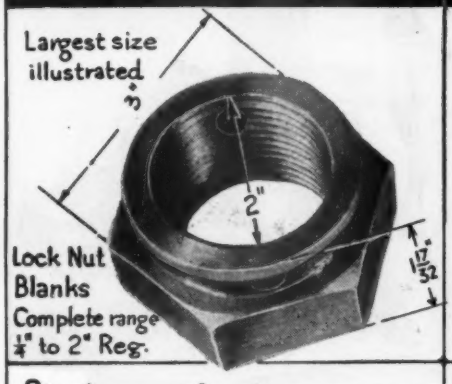

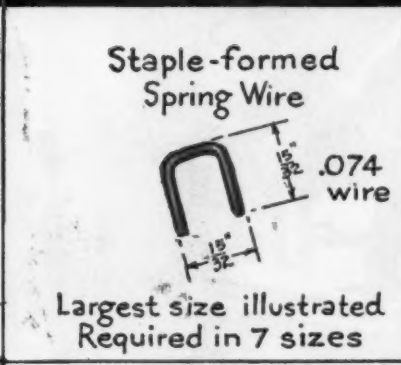

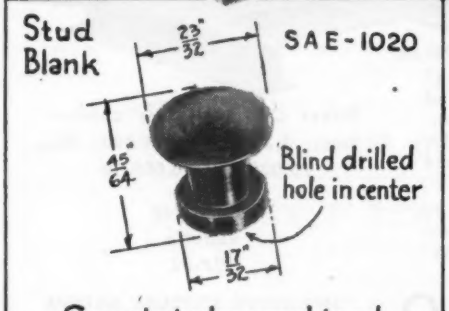

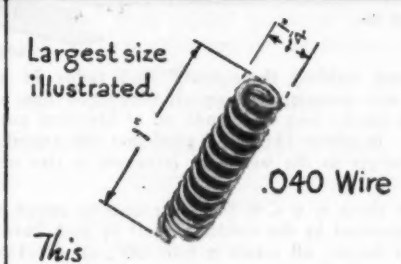

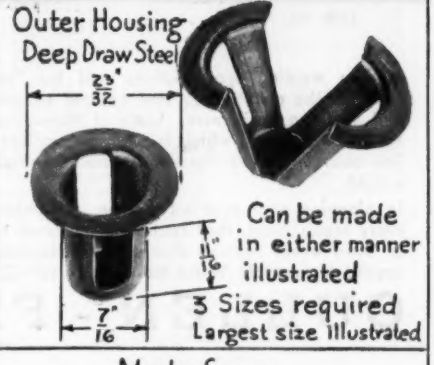

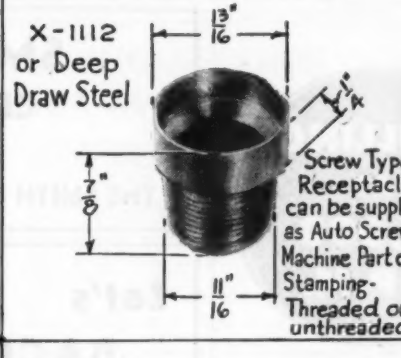
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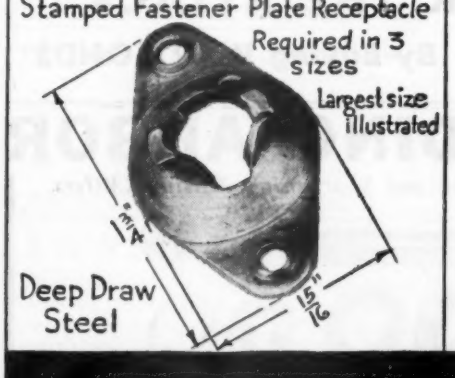

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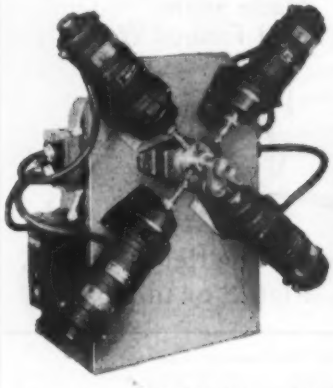

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CRANK SHAPERS

sizes 12" to 32" stroke

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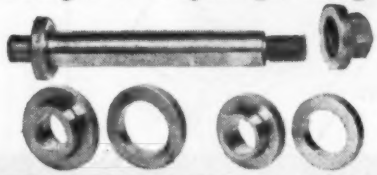
GRINDING ARBOR

for Grinding and Sharpening Milling Cutters



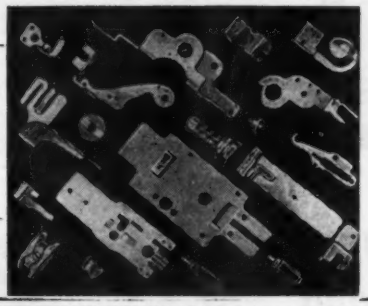
Made of SPECIALLY SELECTED STEEL—Heat treated and Precision ground. SAFETY CENTERS.
Designed for 1" hole cutters, furnished with 2 extra bushings and collars for 1¼" and 1½" hole cutters.
Mfg. by Circle Tool & Gage Co.
Sold Exclusively by

GRINDING SUPPLY CO.

Some territory still open—Write for leaflet M3
415 So. Western Ave. Chicago 6, Illinois

CONTRACT WORK

STAMPINGS AND ASSEMBLIES
IN ALL KINDS OF METALS



Fast and efficient service on long or short runs is guaranteed by our modern equipment and methods, backed by 50 years of experience.

We also offer facilities for the manufacture of screw machine products, tools, dies, jigs and fixtures. Quality work by skilled mechanics is assured. Send your blueprints or samples today.

"GREATER SAVINGS WITH GREIST"

THE GREIST MFG. CO.
546 BLAKE ST. NEW HAVEN, CONN.

PLANT EMPLOYING 200 PEOPLE HAS PRODUCTION TIME OPEN

- CENTERLESS
- TURRET
- MILLERS
- SHAPERS
- GRINDERS
- LATHES
- SUPPORTING EQUIPMENT

Over 200 Machine Tools

BERGEN MACHINE & TOOL CO., INC.
189 Franklin Ave., NUTLEY 10, N. J.

● Machines and Parts,
● Special Tools and Fixtures,
● Cam Milling, on Contract

Your engineering problems will receive efficient and economical service in our modern plant manned with skilled workers. Contact us today for prompt quotations on your blueprints or samples.

Designers and builders of wire and ribbon stock forming machines.

THE A. H. NILSON MACHINE COMPANY, BRIDGEPORT, CONN.

METAL STAMPINGS
• TOOLS • DIES •
PERMANENT MAGNETS
HEAT TREATING
THOMAS & SKINNER
STEEL PRODUCTS CO.
1103 E. 23rd St. INDIANAPOLIS, IND.

AVAILABLE SCREW CAPACITY
¼ to 4½ Automatic and Hand Screws

Including Necessary Secondary Operation
Forward Samples and Blueprints for Quotations

BRIDGEWATER SCREW PRODUCTS CO., Bridgewater, Mass.

WIRE AND METAL SPECIALISTS
in round, flat, square and special shaped wire in all metals.
LARGE PRODUCTION CAPACITY
Plating and finishing.
EASTERN TOOL & MFG. CO.
BLOOMFIELD, N. J.

TOOLS—DIES—JIGS—FIXTURES—GAGES
Tool Engineering—(Designing)

Send us your samples or prints for quotations. Prompt and efficient service.

PRODUCTION TOOL COMPANY
610 Sevier Ave. Knoxville 7, Tenn.

ENGINEERING AVAILABLE

LARGE FIRM HAS TIME AVAILABLE IN ENGINEERING DEPARTMENT, DUE TO WAR CUT BACK. CAN HANDLE TOOL AND PRODUCT DESIGN; DEVELOPMENT WORK AND DRAFTING. STAFF OF 200 MEN; EXPERIENCED ON MANY DIFFERENT PRODUCTS. WILL CONSIDER CONTRACT PRICE OR TIME AND MATERIAL BASIS. CHICAGO AND NEW YORK DIVISIONS.

Box 1210, 217 7th Ave., N. Y.

PRECISION FORM GRINDING

Specialists in grinding Circular and Flat FORM-TOOLS, FORM Counterbores, FORM Flat-Drills, and related types of FORM grinding. Also step-grinding of Tungsten and Molybdenum Rods.

Send Prints for Quotation and Delivery

J. & S. TOOL CO.—477 Main St.—E. Orange 1, N.J.
(Makers of J.&S. Radii & Engle Dressing Tools)

Charles Morhardt & Co.
DESIGNERS
MACHINERY - PRODUCTS - TOOLS
141 BROADWAY NEW YORK-6
BARCLAY 7-0291

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us — we will take care of them
GENERAL PATTERN WORKS
2733 Ruck Street Cincinnati, Ohio

Put Your Idle Capacity to Work

Hundreds of metal-working companies are finding profitable business today outside their regular lines. Tell metal-working America—the 100,000 readers of **American Machinist**—about your facilities. Write

Departmental Staff
AMERICAN MACHINIST
330 W. 42nd St., N. Y. 18, N. Y.

PUNCH PRESS WORK WANTED

Automatic or Hand Feed. Simple Blanking Work from Coiled Stock on Customer's Dies Preferred.

VICTOR SPECIALTIES
8 Morris Street New Rochelle, N. Y.

BUILDERS OF SPECIAL MACHINERY TOOLS & DIES

THE SPECIALTY MACHINE TOOL & DIE CO.
923 Market St. (Rear) Wheeling, W. Va.

INVENTIONS SOUGHT

Will pay cash or royalty for inventions that would sell to consumers for about $1.00 up to $100.00. Automotive parts and tools. The tools, any kind of repair tools, Household articles or small machines.

CONTRACTORS

Let us quote on your subcontracts. TURRET LATHES UP TO 3½" BAR FEED. Engine lathes up to 18" Swing. Milling machines up to 36" tables. Grinding, Welding and other supporting equipment.

DEMERS MACHINE PRODUCTS CO.
331 PLEASANT STREET WORCESTER, MASS.

Long runs for Turret Lathe & Milling Machines.

VAHL ENGINEERING CO.
505 Court St. Brooklyn, N. Y.

MOULD MAKERS

Specializing in molds for the Rubber Industry also facilities for automatic screw machine work up to 11/16.

M & N Machine Tool Works
146 Orono Street Clifton, N. J.

Lucas THE LAST WORD IN REBUILDING MACHINE TOOLS

Accurate Rebuilding begins in the Engineering Department » » » »

PRODUCTION-minded executives in many of our leading industrial plants have come to realize that J. L. Lucas & Son, Inc., have brought something new to the field of machine tool rebuilding. Experienced Lucas craftsmen, under the supervision of a skilled engineering staff, have lifted machinery rebuilding out of the patching and repair class and put it on a precision basis. Because of these advanced methods, every LUCAS-REBUILT machine tool is *guaranteed* to give long and accurate service on the production line. We believe it will pay you to consider putting our engineering staff, our skilled mechanics, our 52,000 square feet of floor space, and our precision equipment, to work reconditioning your production machinery.

THIS is the fourth of a series telling the Story behind the Lucas nameplate on Machine Tools.

Send for our complete illustrated booklet "Rebuilding the Lucas way"

LUCAS of BRIDGEPORT

J. L. LUCAS & SON, INC. **BRIDGEPORT 5, CONN.**

SEARCHLIGHT SECTION

WANTED

MACHINE DESIGNERS

Experienced in the designing of heavy metal working machinery, particularly forming and stamping. Splendid post-war opportunities. Anyone now engaged in war work need not apply.

P-308, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

WANTED

MACHINISTS
MACHINIST OPERATORS
TOOL MAKERS

Permanent full-time employment with America's leading manufacturer of oilfield equipment. Now building vital war materials but has a definite post war future. Living facilities available.

Cardwell Manufacturing Company, Inc.
Box 2001 **Wichita, Kansas**

SENIOR TOOL ENGINEERS
CHIEF TOOL DESIGNER

Openings in Detroit & East. Postwar future. Large engineering firm. Give complete details in reply.

P-255, AMERICAN MACHINIST
520 North Michigan Ave. Chicago 11, Ill.

POSITIONS VACANT

WANTED: DETAIL Mechanical draftsman by machine tool builder in western Pennsylvania. Statement of availability required. Write giving experience, etc. to P-289, American Machinist, 330 W. 42nd St., New York 18, N. Y.

SENIOR AND Junior Industrial Engineers, Positions now open are permanent and afford successful applicants exceptional post-war opportunities. Starting salaries are high. Qualifications: Applicants for both senior and junior positions must be graduate engineers, either in industrial, chemical or mechanical engineering. Senior engineers (ages 28-33) must have had experience in 3 or more of the following time studies, establishing standards, installing labor controls, estimating costs, installing wage incentive systems, handling methods improvement programs. Junior engineers (ages 21-27) without industrial experience will be considered. Inquiries, giving experience, marital and draft status and other pertinent information, should be directed to the Employment Manager, Union Bag & Paper Corporation, Post Office Box 570, Savannah, Georgia. Persons now engaged at highest skill in essential industry cannot be considered. Union Bag & Paper Corporation, Savannah, Ga.

WANTED: A mechanical engineer qualified for the design and development of production machinery. With a long established, well-known company, with national distribution that is aggressively planning for post-war. $5,000 to $6,000 per year to start. A permanent position in a Northern Illinois city of 25,000; 125 miles west of Chicago. Opportunity to develop and head an equipment design department. Write in detail stating age and qualifications. P-321, Amer. Machinist, 520 N. Michigan Av., Chicago 11.

WANTED ESTIMATOR—An old, well established tool shop in northern Ohio, desires the services of a man capable of estimating gauges, jigs, fixtures, dies and special machinery. Position permanent. Should you have this ability, write giving full background as to experience, education, draft status and former positions held. Compensation open. Write P-322, American Machinist, 330 W. 42nd St., New York 18, N. Y.

(Continued on page 299)

WANTED

MECHANICAL ENGINEER

Large light metal manufacturing concern in New England has an opening for a graduate engineer who has a thorough practical and theoretical knowledge of tool design and production. Must be familiar with hydraulic presses, small stampings and findings. Should be capable of supervising at least 100 skilled employees. Excellent possibilities for advancement. Only qualified persons should apply.

Please state age, education, experience, and salary desired. Permanent post war job.

P-316, American Machinist
330 West 42nd Street, New York 18, N. Y.

WORKS MANAGER WANTED

To operate metal manufacturing plant in Chicago. Company employs about 500 people. Man must have technical and line background, and experience in a functional organization. Attractive salary to right man.

P-312, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

WANTED

Layout Loftsmen and Checkers with three to five years experience on sheetmetal loft layout. Must have educational background to qualify for position with established New England Company. Good post-war possibilities. Write, giving qualifications, draft status, age and salary requirements.

GENERAL AIRCRAFT EQUIPMENT, INC.
22 Elizabeth Street South Norwalk, Conn.

DRAFTSMAN
LEADING MAN

Leading man wanted by medium size manufacturer of heavy machinery. Applicants should have thorough experience on excavating machinery or marine auxiliaries or similar, and be qualified for rapid advancement to the position of chief draftsman, taking full charge under chief designer. Permanent position for qualified man. This company in business sixty years, now working to capacity on its regular peacetime product on high priority, essential industry. Location Eastern seaboard. Applicant should give full information as to age, experience, and starting salary expected. WMC Regulations apply.

P-313, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

FACTORY SUPT.

Executive qualified to take charge of large production unit in Newark plant. Firm manufactures small metal articles to close tolerances.

Applicant must be thoroughly familiar with all phases of modern production methods. Prefer a man 40 to 50 years with M.E. or equivalent. Write fully.

BOX 433, REALSERVICE
110 W. 34th St., New York 1, N. Y.

POSITIONS VACANT
(Continued from page 298)

WANTED—Tool-Room Foreman—capable of taking charge of entire tool room comprising approximately 60 men. Must have considerable experience with progressive dies, draw dies, gauges, jig and fixture work for small and medium sized stampings. Permanent position. Write giving full particulars as to age, experience, with whom, and salary expected. P-323, American Machinist, 330 W. 42nd St., New York 18.

YOUNG AND Aggressive man who is experienced in all phases of manufacturing small carbon steel forgings including die making is wanted by established Ohio valley concern to supervise the installation and operation of a forge shop. Give all data re: education, experience, and salary in first letter. This advertisement is known to our organization. Replies will be treated in confidence. Reply P-324, Amer. Mach., 520 N. Michigan Av., Chicago 11.

WORKS MANAGER: Well established heavy industry making equipment for cutting, and forming sheet metal has opening. Give details of education, personal qualifications and work history in letter of application which will be held in confidence. Employment in accordance with existing W.M.C. regulations. Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11, N. Y.

SUPERINTENDENT: Well established heavy industry making equipment for cutting and forming sheet metal has opening. Give details of education, personal qualifications and work history in letter of application which will be held in confidence. Employment in accordance with existing W.M.C. regulations. Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS—This advertising service of 35 years' recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details. R. W. Bixby, Inc., 366 Delaware Bldg., Buffalo 2, N. Y.

POSITIONS WANTED

TOOLROOM FOREMAN, long and varied experience metal stamping work, prefers a southern or western location. PW-280, American Mach., 520 N. Michigan Av., Chicago 11.

SUPERINTENDENT—FACTORY Manager. A seasoned industrial executive of 50 with a background of 32 years in the machine and tool game. Engaged in the making of precision tools, dies, jigs, fixtures, gages, and special machinery. 16 years practical, 16 years executive experience. PW-306, Amer. Mach., 330 W. 42 St., N. Y. 18.

AVAILABLE IN the Philadelphia district, about August 1st, a well experienced machine or tool shop executive, thoroughly familiar with design of tools and machinery or development work, shop operation, and purchases of light and equipment. Well qualified to act as chief draftsman or other executive shop capacity. This man is well known in the Phila. area and only unusual circumstances make him available for a position at this time. Please write and I will contact for appointment. PW-325, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PRODUCTION ENGINEER or Works Manager, 30 years of practical experience in designing and building precision tools for high production, desires permanent position with responsible manufacturer. PW-326, American Machinist, 330 W. 42nd St., New York 18, N. Y.

WORKS MANAGER and chief engineer, 44, desires connection with sound company having good post-war possibilities. Experience includes work as chief engineer and works manager of steel fabricator and machinery manufacturer; assistant chief engineer and production engineer of aircraft companies; chief, tooling div. of large company manufacturing machinery, etc., in charge of planning methods, processing, tool design and tool making. Have worked continuously on engineering, tooling and production. Have been connected with Lockheed, General Motors, etc. Salary $12,000.00. PW-327, American Machinist, 330 W. 42nd St., New York 18, N. Y.

SALESMAN WANTED

SYSTEM SALES engineer. Previous sales experience unnecessary, but diversified production experience essential. We specialize in industrial controls—production, machine loading, costs, tools, materials, etc. Exceptional permanent opportunity for men capable of further developing established districts. SW-328, American Mach., 520 N. Michigan Av., Chicago 11.

REPRESENTATIVES WANTED

WANTED: TO Represent manufacture of mechanical and clerical products suitable for suburban and rural trade. Efficient sales, installation and maintenance services available, location Central Michigan. Bank reference. RW-292, American Machinist, 330 W. 42nd St., New York 18, N. Y.

(Continued on page 300)

A group composed of high-grade experienced factory-manager, sales-manager and office-manager are forming a sales organization to represent as manufacturers' agents, companies engaged in the manufacture of machine tool and metal trades, accessories, instruments, tools etc. Experience of group covers a thorough knowledge of all phases of design, processing, fabrication, purchasing and sales in the metal trades.

We are a progressive sales and engineering minded group and desire to contact equally progressive concerns who are seeking representation in Wisconsin, Illinois and Minnesota or adjacent territories.

RA-317, American Machinist
520 N. Michigan Ave., Chicago 11, Ill.

Firm of Brazilian and American Machinery merchants specializing in machine tools and power plant equipment with warehouses in Philadelphia and Rio de Janeiro and offices in principal cities of Brazil desires exclusive representation for Brazil of leading manufacturers on stocking distributor basis. All export details handled by Philadelphia office. For details and financial rating write:

MR. J. DE V. F.
c/o THE O'BRIEN MACHINERY COMPANY
113 N. Third St., Philadelphia 6, Pa.

WANTED
ENGINEERS
MACHINE
DEVELOPMENT

Graduate engineer or equivalent, experienced in the design and development of special and experimental machines. Men with creative ability required, experienced in such lines as automatic, semi-automatic, or ordnance equipment. Must be thoroughly acquainted with modern methods and shop practices and capable of developing new ideas in conjunction with modern mechanical laboratory facilities.

State age, marital status, details of education, experience, draft status, present salary and salary expected. Enclose recent photograph or snapshot.

Post-war opportunity.

Applicants must be able to obtain Statement of Availability.

E. I. du Pont de Nemours & Company, Inc.
Personnel Division
Wilmington 98, Delaware

WANTED
INDUSTRIAL CONTROL ENGINEER

We are interested in securing an electrical engineer to develop industrial control apparatus.

Applicant should be familiar with competitive designs, and have working knowledge of tests and working methods, Underwriter's requirements and NEMA standards for electric motor control.

Excellent opportunity to qualify for a permanent supervisory position in Engineering Department of an expanding organization well established in the automotive electrical and magnetic relay field. In applying give age and complete resume of experience.

R-B-M MANUFACTURING CO.
Division Essex Wire Corp.
LOGANSPORT INDIANA

TOOL ROOM SUPT.
NEWARK

To supervise large tool room. Mechanical engineering background and a minimum of 10 yrs. diversified practical experience in the manufacture of small precision dies and tools essential. Work will include planning and Personnel administration.

Prefer applicant 40 to 50 yrs. who is thoroughly familiar with various phases of mass production manufacture of metal articles. We are a long established company and have no reconversion problems.

BOX 443, REALSERVICE
110 W. 34th St., New York 1, N. Y.

(Additional Employment Advertising on page 300)

REPRESENTATIVES WANTED
(Continued from page 299)

DIAMOND TOOL manufacturing want local representatives in various territories. Already handling grinding wheels, grinding machinery, or other tools, or having excellent contacts in metal or plastic fabricating industry. Commission basis. RW-307, American Machinist, 330 W. 42nd St., New York 18, N. Y.

REPRESENTATIVE AVAILABLE

WELL FINANCED St. Louis machinery dealer desires additional lines of machine tools such as lathes, milling machines, shapers, drill presses, brakes, hack saws, home work shop woodworking equipment, and kindred lines. P. O. Box 3317 Progress Station, St. Louis, Missouri.

BUSINESS OPPORTUNITY

WANTED: A man with capital to invest in the manufacture of automatic screw machine products. We have 25 years experience in this line of work. BO-329, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PATENT ATTORNEY

PATENTS, COPYRIGHTS, Booklet, "General Information concerning Inventions and Patents" and "Free Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N.W., Washington 5, D.C.

WANTED

A good metal stamping line for Northwestern Ohio and Southeastern Michigan, with our office in Toledo. If your Post War Plans embrace top notch representation in this territory and if you have a good line of metal stampings, we would appreciate hearing from you. Address

RA-311, AMERICAN MACHINIST
520 North Michigan Avenue Chicago 11, Ill.

WANTED

First Class Special Machinery Line for Northwestern Ohio and Southeastern Michigan, with our office in Toledo. If you are interested in thorough coverage by good engineers and if you have a good line to offer, we would appreciate hearing from you. Write

RA-315, AMERICAN MACHINIST
520 North Michigan Avenue Chicago 11, Ill.

WANTED

Good Screw Machine Parts Line for Northwestern Ohio and Southeastern Michigan, with our office in Toledo. If your Post War plans embrace top notch representation in this territory and if you have a good line of screw machine parts, we would appreciate hearing from you. Address

RA-310, AMERICAN MACHINIST
520 North Michigan Avenue Chicago 11, Ill.

WANTED

First Class Steel Forging line for Northwestern Ohio and Southeastern Michigan with our office in Toledo. If you are interested in good coverage by first class engineers and if you have a good line, we would like to hear from you. Write

RA-309, AMERICAN MACHINIST
520 North Michigan Avenue Chicago 11, Ill.

Flexible joint of modern design for underground Conveyor Belts required for the British Coalfields. Would entertain agency or manufacturing rights. Write

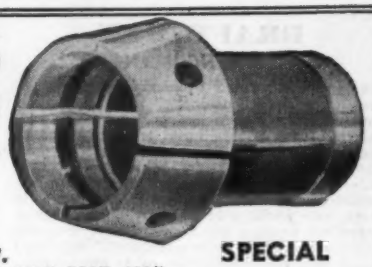
BO-314, AMERICAN MACHINIST
Aldwych House, Aldwych, London, W.C.2

BUSINESS FOR SALE

Well equipped plant for the manufacture of ornamental iron and electric lighting fixtures. Show room, stock room, work shop, also plating, blacksmith and welding shops especially arranged for this type of business. Total area 50 ft. x 142 ft. Five room modern owner's apartment on second story. Located in the Southwest. Business is a going concern with wide reputation. Large inventory of lighting fixtures and parts. Priced complete at $40,000.00.

BO-320, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

USED COLLETS
FEED FINGERS — PADS



ACME, No. 515, No. 52, No. 53, No. 54, No. 55, No. 56.
ACME-GRIDLEY 1⅛"
Cleveland ⅞" to 2½".
Cone 1¼", 1½", 2½", 4".
Foster No. 1, No. 2, No. 3, No. 4, No. 5, No. 7.
Gridley, Models F, ¾", ⅞", 1¼", 1⅜", 2¼", 2½", 3¼", 4¼".
⅞ Model "G" Gridley Form, Lead and Cut Off Cams.
No. 4 & No. 6 Warner & Swasey.
Bardons & Oliver, Brown & Sharpe, Davenport, Garvin.
LARGE STOCK OF ⅝x5 NEW BRITAINS.
Change Gears, Lead Cams, Form Cams, No. 53 to No. 56 Acme.
Spindle gears, finger holders, collet tubes, push tubes, spindles, nose pieces for 2⅝" F Gridley.
Large stock 1¾" F. Gridley Collets.

SPECIAL
10 x 5 Browne & Sharpe Face Mill Cutters. Vertical Head for large mill.

MONA MEMBER

GRAFF MACHINE TOOL COMPANY
7140 So. Halsted Street Vincennes 9664 Chicago 21, Ill.

SEND FOR OUR SPECIAL PRICES OF PRECISION TAPPER GROUND TAPS

High speed tapper taps, bent and straight shank. Sizes ranging 3/56 to 10/32 in 90° bent shank. Sizes ranging ¼-28 to ½-20 NF in 90° & 180° bent shank. Sizes ranging ¼-28 to ¾-16 in Acme and straight shank 15" overall. ALL GOOD STANDARD BRANDS FOR IMMEDIATE DELIVERY.

DE WITT TOOL COMPANY
173 GRAND STREET, NEW YORK 13, N. Y.
SEND US YOUR INQUIRIES

WANTED

New or used Rotary Double Pointed Tack Machine, as manufactured by A. H. Nilson Machine Company or equal.

M. D. GIARDINO
101 PARK AVENUE, NEW YORK 17, N. Y.
LExington 2-9288

WANTED

Gorton #3L, 3 dimensional, Engraving Machine, Gorton #375-2 Cutter Grinder. Please give age, serial number, mechanical condition and price.

W-319, AMERICAN MACHINIST
520 North Michigan Ave., Chicago 11, Ill.

WANTED PUNCH PRESS

About 35 ton capacity with or without motor drive. Must be in A1 condition. Write

P. Keppeler, Dependable Mfg. Co.
2073 N. Southport Ave. Chicago, Ill.

An old established business strategically located in the deep South, entered the field of metal stamping and forming for war contracts. They equipped their plant for an excellent manner, which can be used advantageously in post war work.

This company would be interested in carrying on this department under the management and possible financing of other competent parties, or making some mutually satisfactory arrangement.

Correspondence leading to an interview is invited

BO-297, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

SHEET METAL MACHINERY

NEW and USED—Hand and Power Brakes, Shears, Forming Rolls, Folders, Punches, Rotary Machines, Stakes, Spot and Arc Welders

MONA MEMBER

B. D. BROOKS, INC.
301 Atlantic Ave., Boston, Mass.

Reed Prentice 27"x18' Bed Quick Change Gear, 12-Speed Geared Head Engine Lathe —Taper Attachment. 10 H.P. 3/60/20 Motor with "V" Belt Drive.

Raising blocks to swing 40"

H. J. KOONTZ
PHONE 8180 MASSILLON, OHIO

FOR SALE

1942 ONAN—Portable Generator—Model V-45 4½ K. W.—6.3—KVA—V-4 Cylinder Gas Driven—110 Volt 60 Cycle—220 Volt Single Phase—Serial No. 82-42601—Weather-proof Cover—Phone for information Baldwin 1217M or ME: 3-1546.

V. LANGDON
38 SOUTHARD ST. BALDWIN, L. I.

FOR SALE
600 TON HYDRAULIC PRESS

Watson Stillman rebuilt 48" single daylight opening, downward double acting ram 16" dia. by 21" stroke, platen 24"x24" with clear space left to right 30¼" between 5½" dia. strain rods. We will purchase your Surplus Equipment.

UNIVERSAL HYDRAULIC MACHINERY CO.
285 Hudson Street New York, N. Y.

FORGING MACHINERY

One 7" and one 8" UPSETTING AND FORGING MACHINES—LATEST TYPE
One 20,000# STEAM DROP HAMMER
One set large size FORGING ROLLS

FS-299, AMERICAN MACHINIST
520 North Michigan Ave., Chicago 11, Ill.

EVERY ITEM GUARANTEED AS REPRESENTED

FALK FOR DEPENDABILITY IN REBUILT MACHINERY

MORE VALUE FOR YOUR MONEY

• • • OUR INVESTMENT IS YOUR SECURITY
• • • SOUND RECONDITIONING

EXCEPTIONAL ITEMS FROM OUR MODERN STOCK

SHEARS & METAL CUTTING MACHINERY

Lennox Splitting Shear, ¾" cap.; 8' throat.
Lennox Bevel Shear, ¾" cap.
Niagara #98 Production Power Brake & Folder. 72"x14 ga. cap. Equal to new.
Bliss #232 Slitting Shear, 14 ga.
Gould & Eberhardt Slitting Shear, 10 ga.
Niagara 16 ga. x 42" Gap Foot Shear.
Niagara #216-B Slitting & Circle Shear.
Niagara #9S Power Seamer.
4" x 42" Geared Slip Roll Former.
3" x 36" Geared Slip Roll Former.
Niagara 48" Roller Leveller.
Niagara #30 Beader & Flanger.
Niagara #0 Beader.

POWER PRESS HEADQUARTERS

#4 Bliss D.C. B.G. Forging 3" stroke.
Toledo #34 Back Flywheel, arranged M.D.
Bliss-"Stiles", No. 1, Plain flywheel.
Waterbury-Farrel 105-ton O.B.I., M.D., hi-spd, power Press, double roll feed. 1" stroke, Bed 37" R to L, 20" F to B.
Bliss #16 Horn Press, adj.
Etna #12 Dble Act. Plain.
#203E Toledo Gap Dbl. Cr.
#P3 Ferracute High Col., M.D.
Bliss #2A Adjustable bed Horn Press, 2½" stroke, back flywheel.
Erdle #4, Stiles type, 1½" stroke.
Baxendale #20, OBI, 2" stroke.

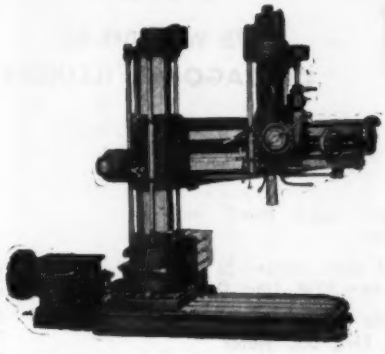
Waterbury-Farrel Cold Header, double stroke, open die, ½" cap.
Manville Cold Header, single stroke, solid die, 3/16" cap.

BORING MILLS

100" Niles-Bement-Pond Bor. & Turn. Mill.
48" Gisholt, vert. Boring & Turning Mill.
Horiz. #36 Landis-Rochester, 3½ Bar Floor Type—Floor Plate 72" x 120".
42" Bullard Vertical Boring Mill with side head; New Era Type.
54" Colburn Vertical Boring Mill.
#31 Lucas Horizontal Boring Mill, 3" bar.

PLANERS

120"x72"x35' Betts, 4 Heads, M.D.
48"x48"x12' Putnam Heavy, 2 Heads, M.D.
30"x30"x12' American M.D., 2 Heads.
30"x30"x10' Cinn. Heavy Pattern, 2 Hds.
20"x20"x24" N.-B.-P., Planer Shaper, M.D.



Cincinnati-Bickford 5' Arm, 13" round column with air clamp. Oil grooved, tee slotted base, side base, with plain box table with #5 Morse Taper spindle. Motor drive.

GRINDERS

16" Heald Rotary Surface Grinder.
16" Persons-Arter Rotary Surface Grinder.
#4 Brown & Sharpe Universal Grinder.
#12 Greenfield Internal Hydromatic Grinder, sizematic type, complete with Tank and Pump. 15" swing, 5" hole, 4" dee.
Oliver Model 51 Drill Grinder; 1½" cap.
14"x36" Cincinnati Cyl., motor driven.
6"x32" Norton Cyl., overhead c/s drive.
Brown & Sharpe #2 Surface Grinder, with chuck & rectifier.

MILLING MACHINES

No. OY Brown & Sharpe plain (2).
#3, #4, #5 Cinn., High Power, Plain, S.P.D.
No. 0 Bickett Vertical Bench Miller.
#1-#1½-#2 Brown & Sharpe Plain Millers.
No. 1½ Valley City Universal, Cone Dr.
P & W 2½" Duplex Spline Miller.
Hall Planetary Thread Miller 24".
No. 8 Lees Bradner Thread Miller.

DRILLING MACHINES

Bickford 4-spindle Rail Drill, #4 Morse Taper. Table 20"x67".
Avey, 2 & 3 spindle Prentice; 4 spindle.
Henry & Wright, 6 spindle.
Woodward & Rogers, 6 spindle.
Fosdick 13", 4 spindle (2). 2 spindle (1).

RADIAL DRILLS

3' Dreses, 10" rd. col. QCG., M.D.
2½' Arm 9" Col. Cincinnati Bickford.
5' Arm 13" Rd. Col. Cinn. Bick. air clamp.
6' Arm 14" Col. Cincinnati Bickford.
3' 9" col. American, S.P.D.

MULTIPLE DRILLS

Fox #15H 54 spindle hydraulic feed.
Natco #D-5, 10 spindles #1 M.T.

LATHES

16 x 8 Hendey Arranged M.D.
14 x 6 Pratt & Whitney semi—Q.C.G.
Putnam, 26 x 12 Heavy Q.C.G., arr. for M.D.
Hendey, 16 x 10 Q.C.G., Turner M.D.
Potter & Johnston #6A Automatic Chuckers; 3½" dia. hole in spindle (2).
Seneca Falls Tool Room, 14 x 6, Q.C.G.
20 x 10 Lodge & Shipley, G.H., M.D., Taper.
16" Warner & Swasey Fox Brass (2).
16" Dreses Fox Brass.
Lodge & Shipley 16" x 8' 12-Speed G.H.
Hendey 14" x 6' Toolroom Lathe, taper, M.D.

AUTOMATICS

1—1¼" Cone 4-spindle Automatic.
Brown & Sharpe #0G Automatic.
Brown & Sharpe #00G Automatic.
Screw Threading Machine.

SHAPERS AND GEAR CUTTERS

26" Cincinnati Triple Geared, Belt Dr.
12" Schuchart & Schutte Gear Hobber.
#1 Adams Gear Hobbers, Belt driven (3).
14" Rockford crank shaper.
No. 2 Baker Keyseater.

MISCELLANEOUS

J. C. Miller Co. Lacq. Heater with acquistat. Heat Treating Furnaces for the tool room.
Sleeper & Hartley #1 Wire coiling machine for making BX cable.
50 K.W. Moesta Gun Welder Transformer, portable, 25 cy. 440 volts.
Blake and Knowles 12x2x12 Simplex Type, Hydraulic Steam Pump, 2000 lbs. pressure with 80 to 125 lbs. steam, delivers 9 gallons per minute.
#228C Greenlee Vertical Hollow Chisel Mortizer, Power feed, M.D.
No. 7B High Speed Riveting Hammer, cap. ¾" to 1½". New this year.
Standard Automatic Drop Hammer, 300#.

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MACHINERY COMPANY
Machinery Merchants

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KELLER DIE SINKERS

FOR IMMEDIATE DELIVERY

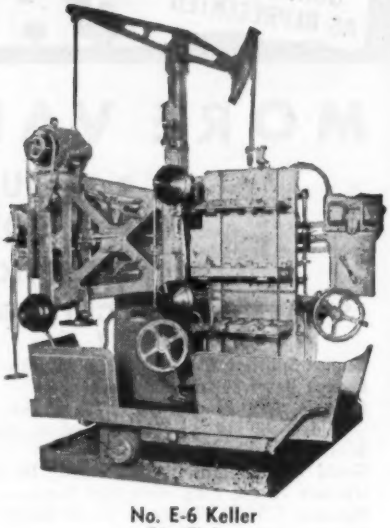
No. BG-724 Keller Automatic Profiler for Die Sinking, Milling and Profiling

Die capacity — face 88" x 48" depth with standard table 30" depth with extension table 58"
Head vertical travel 48"; horizontal travel 72"
Spindle head travel 18"
Maximum reach of spindle 24"
Center distance between cutter and spindle tracer max. 50½"; min. 35½".
Working surface standard table 88" x 30"
Working surface extension table 88" x 58"

Equipped with panel board and switch boxes
Vertical feed drive motor—¾ HP. 110 volts, vary RPM, Ohio D.C.
Cutter spindle motor—2 HP. 115 volts, Gen. Elec. D.C. motor
Column drive motor—⅝ HP. intermittent duty, 115 volts, G.E. D.C.
Horizontal traverse motor—⅛ HP. 115 volts, Ohio D.C.
Weight approx. 16,500#

EMERMAN MACHINERY CORP.

875 W. 120th St.
CHICAGO 43, ILLINOIS



No. E-6 Keller Die Sinker

Die capacity 20" x 27" face x 12" high
Work table 20" x 50"
Cross slide travel 24"—.002" to .040" feed
Table speeds 4" to 24" per minute
Distance between 24"
Spindle speeds 620 to 3600 RPM.
Complete with motors, coolant system and splash guards
Weight approx. 6850#

3 AVAILABLE IN STOCK

REYNOLDS
USED MACHINERY BARGAINS

1—800# Automatic Drop Hammer—Standard Machinery Co. (new condition)
1—Vertical Slotter—Logansport—M.D.—new 1942
1—#4 Marking Machine—Noble & Westbrook—new 1943
1—#10 B & S Plain Cylindrical Grinder—6" x 20"
3—#000 B & S Plain Automatic Millers—M.D.
1—#10 B & S Plain Automatic Miller, M.D., Electric Control
1—2 Spindle Profiler—Morey—M.D.—new 1941
1—#100 Mi-cro-matic Honing Machine—new 1943
1—Air Compressor — Chicago — 1300 C.F.M.—20"x12"x14" Twin 225 HP motor
2—1" x 18" Deep Hole Drilling Machines—Krueger—Horizontal—New 1940
1—16"x72" Norton Surface Grinder with 16"x72" Magnetic Chuck
1—#5B B & S Plain Miller—Table 21" x 78"
1—#4B B & S Plain Miller—Single Pulley Drive

REYNOLDS MACHINERY COMPANY
210 Eddy St. Providence 3, R. I.

#18 Blanchard Vertical Surface Grinder, 30" magnetic Chuck
12" Gleason Straight Bevel Gear Generator
3" Gleason Straight Bevel Gear Generator
18" x 30" Lodge & Shipley Lathe
14" x 30" Monarch-Keller Lathe
#61-A Fellows Gear Shaper

All latest type machines.

Many more. Send us your inquiries.

HAZARD BROWNELL
Machine Tools
350 Waterman St., Providence 6, R.I.
Dexter 8880

LARGE LATHES

30"x26' Lodge & Shipley 12 speed Geared Head, M.D.
32"x35' Wickes Grd. Hd., M.D.
36"x30' Putnam Grd. Hd., M.D.
42"x16' Putnam, M.D.
36"x22' Putnam Geared D.C. M.D.

AARON MACHINERY CO.
45 CROSBY STREET NEW YORK, N.Y.

Boring Mills, 36"-42"-52"-72"-96".
Miller Vertical, #3 B. & S., S.P.D.
Miller & Shaper, #14 Cochrane-Bly, Vert., M.D.
Press, Forging 1000 Ton United, St.-Hyd.
Planer, 36"x36"x12' Powell 4 Hds.
Profiler, #13 P. & W., B.D.
Shaper, 20"-24"-32".
Shaper, 36" Morton, Draw Cut
Straightener, Sheet 42" W-F M.D.

West Penn Machinery Company
1210 House Bldg. Pittsburgh, Pa.

MISCELLANEOUS MACHINES

1—56"x56"x18' Cinci. Dbl. Housing Planer with 3 hds., box table, auto. oiled D.C. vari. speed m.d.
1—6' Niles Pl. Radial Drill, rebuilt, gear box, A.C. m.d.
1—3" bar Morris Horiz. Boring Mill, with 5 boring bars, m.d.
1—#2½ American 2-spdl. Wood Shaper
1—#1 New Beach Comb. Rip and Cut-off Saw

STRONG, CARLISLE & HAMMOND CO.
1392 West Third St., Cleveland 13, Ohio
Branch Office
Board at Chatfield, Detroit 9, Michigan

POWER PRESSES

125 Ton—PERKINS—TOGGLE—DOUBLE ACTION WT. 20,000 LBS.
60 Ton—FERRACUTE—EMBOSSING & COINING WIRE — PHONE — WRITE

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PLANER (Double Housing)

60"x60"x18' Niles-Bement-Pond "Timesaver", 4-heads, power rapid traverse, with motors of 220 volts D.C. Also M.G. Set 3/60/220 to 230 volts D.C. Near new.

GALBREATH MACHINERY CO.
EMPIRE BUILDING PITTSBURGH 22, PA.

IN STOCK

LATHES

50"x20' b.c. Johnson, 2 carriages, G.H., M.D.
48"x26' Putnam, G.H., M.D.
48"x24' Blocked to 80" Fifield, D.B.G.
42"x20' Lodge & Shipley, M.D.
36"x16' Niles-Bement-Pond, Q.C. G. H. M. D. Taper
2—36"x14' Niles-Bement-Pond, Q.C. G.H. M.D. Taper
36"x14' Niles-Bement-Pond, Cone, B.G. M.D.
30"x17' Blocked to 58" Houston, Q.C. M.D. B.G. Grind. Attach.
27"x18' Leblond, M.D.
24"x12' Putnam
24"x10' Flather, Q.C. B.G. M.D.
20" Multi-Cut Leblond, G.H. Taper
2—18"x10' American, G.H. M.D.
3—18"x8' Springfield, Q.C. D.B.G. Taper
16"x6' Monarch, Q.C.G. M.D.
14"x6' Pratt & Whitney
14"x6' American, Q.C.G. M.D.
10"x4' Sundstrand Production
Many bench lathes

TURRET LATHES

4½" Bardons & Oliver, Bar Feed, M.D.
3" Foster, Bar feed, M.D.
3½" Potter & Johnson, G.H. M.D. without motor
5A Potter & Johnson, Auto. Chuck. & Turning
4"x34" Jones & Lamson, M.D. 1930 model
3"x36" Jones & Lamson, G.H.
#6 Warner & Swasey, Bar, M.D.
1½" Pratt & Whitney
#2 Warner & Swasey, M.D.
#1B Foster Universal, M.D.
1" Foster, M.D.
#3 Warner & Swasey, hand, 1¼" Cap.
Pratt & Whitney Hand Screw
⅞" Stark Bench
⅝" Pratt & Whitney Bench, M.D.

BORING MILLS

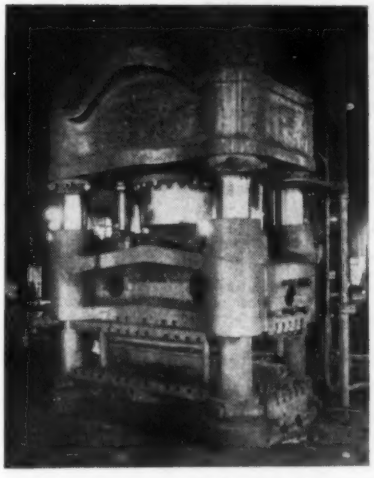
10' Betts Vert. M.D. P.R.T.
8' Niles Vert. M.D. P.R.T.
42" Bullard, Vert. New Era
36" Bullard, Vert. New Era
24" Bullard, Vert. Rapid Prod.
4" Barret, Horiz. Floor type

RADIAL DRILLS

6' Cincinnati-Bickford, 15" Col. S.P.D.
5' Cincinnati-Bickford, 13" Col. S.P.D.
5' Morris, 13" Col. M.D.
3' Cincinnati-Bickford, 9" Col. S.P.D.

MILLERS

36"x36"x10' Ingersoll, Planer type, 4 Heads, M.D.
#4 Cincinnati Plain. 3 step. D.B.G. M.D.
#4B Brown & Sharpe. S.P.D. M.D.
#4 Milwaukee. Plain. M.D.
#3-K Milwaukee. Plain. M.D. 1939 model
#2 Garvin. Plain
#1½ Cincinnati, Plain
#26 Becker, Plain
#25 Becker, Plain
#5 Cincinnati Hi Power Universal, S.P.D.
2—#4 Cincinnati Universal, S.P.D.
#3 Cincinnati Universal, S.P.D.



3000 Ton R.D. Wood Hydraulic

#2A Brown & Sharpe, Universal, S.P.D.
#2M Cincinnati Universal, M.D.
#1M Cincinnati Universal, M.D.
#3 Cincinnati Vertical, S.P.D.
#08 Cincinnati Vertical
#2 Brown & Sharpe Vertical, M.D.
Model C Becker Vertical, Rotary table, M.D.
Model AB Becker Vertical, S.P.D.
Lees-Bradner Automatic Thread Miller, M.D.
12"x48" Pratt & Whitney Thread Miller
#12 Brown & Sharpe Production, Arr., M.D.
6¾"x18" table Pratt & Whitney Prod.
#7 Becker, Lincoln type
#6 Whitney Hand Miller

SHAPERS

24" Gould & Eberhardt, M.D.
20" Steptoe, M.D.
20" Stockbridge, M.D.
14" Barker, M.D.
7" Rhodes Comb. Shaper & Slotter

AUTOMATICS

#00, #0, #2 Brown & Sharpe
1¾" Gridley, M.D.
6—1⅝" New Britain, Late type
⅝", 1", 1⅝" New Britain, 6 Sp., M.D.
⅝"-⅞"-7" Cleveland, Single Sp.
3" Cleveland, Single Sp.
#52, #53, #55 National Acmes
⅜", 7/16", ½" Ceco, Gorton (Swiss)

PLANERS

72"x72"x26' Sellers, 4 heads, M.D.
42"x42"x16' Niles-Bement-Pond, 3 heads, M.D.
42"x42"x10' Gray, 4 heads, M.D.
30"x30"x 8' Pond, 2 heads, M.D.
24"x24"x 6' Bullard, 1 head, M.D.

HAMMERS, PRESSES & OTHER FORGING EQUIPMENT

4" & 5" Ajax Horizontal Upsetters
2—R. D. Wood Hydraulic Forging Presses, 2500 & 3000 tons
2—Watson-Stillman Hydraulic, 600 and 1000 tons
Farnham Hydraulic, 250 tons, 4 post., 4" dia.
6—Steam Drop Hammers, 100#, 500#, 600#, 1100#, 1500#, 3800#, 2000# Steam Hammer
#57 & #58 Toledo Geared Trimming Presses
#73½ Bliss Geared Trimming Press, Flywheel type
25"x5"x18", 16"x26"x7"x18", 22"x11"x18", 18"x4"x18" Pumps
DD55—75 ton Ferracute Blanking & Cupping Double Action Press. 1930 machine
50 ton Bulldozer, Double Action
R. D. Wood Accumulator 32" dia. x 18" stroke. 600 gal. cap.
#2 Waterbury Header
#0 Baird Header
#60¼ Toledo Power Press. 1200 ton. 22" stroke. 75 HP motor
#1, #1½, #3A Bliss Presses
42" Hillers & Jones Metal Straightening Machine
Miscellaneous smaller presses in stock

GRINDERS

#2 Brown & Sharpe Universal
#13 Brown & Sharpe Universal & Tool
#4 Gallmeyer & Livingston Universal Tool & Cutter, M.D.
#2 Cincinnati Univ. Tool Grinder, M.D.
#1½ Cincinnati Univ. Tool Grinder
#11 Landis Plain Cylindrical, M.D.
6"x30" Pratt & Whitney Cylindrical, M.D.
#70 Heald Internal, M.D.
2—#1G Abrasive Internal, Bench type, M D.
14" swing Taylor & Fenn. Internal, M.D.
9" Heald Rotary Surface, M.D.
3—#2 Brown & Sharpe Surface, M.D.
20"x60" table Pratt & Whitney Vert., Surface, M.D., Mag. Chuck
21½"x50½" work. surf., of table-Springfield Vert., S.P., M.D.
8' Bridgeport Knife Grinder
Many Disc Grinders

PUNCH & SHEARS

Adlerhurst Punch & Shear, 1"x6", 25" throat
#20 Pels Punch & Shear, M.D.
Pels Punch & Shear on wheels, Throat 8"
#2 Bethlehem Circular Power, gap 30"
10' Geo. A. Ohl Shear, 10 gauge
8' Niagara Power—14 gauge, 20" gap
2—8' Stohl Power Squaring—14 gauge

MISCELLANEOUS

2—#510 Campbell Abrasive Cutters, 10"x12' M.D. (Brand New)
¼"x12'6" Griswold Brake
10'—16 gauge Dreis & Krump Brake
10'—10 gauge George A. Ohl Brake
8'—16 gauge Robinson Power Press Brake
11" Gleason Bevel Gear Generator
#12 Pratt & Whitney Profiler
36" Corrugating Machine, ⅜"x⅜"
Bolt & Pipe Threaders
30" Wm. Laidlaw Bandsaw, M.D.
Bliss & Rafter Forming Rolls
30 & 50 KW Spot Welders
Tapping Machines
Engraving Machine
E-3 Keller Auto. Die Sinking Machine
Barnes Honing & Rifling Machines.

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S & S MACHINERY COMPANY

207 CENTRE STREET **NEW YORK 13, N. Y.**

QUALITY TOOLS

AUTOMATICS

⅛", No. OG Brown & Sharpe
⅞" and 2" Cleveland Model B
1⅜" Gridley Model G 4 spindle
1⅝" New Britain 6 spindle
4½" Gridley 4-spindle Model H
No. 454 New Britain, 4-spindle chucking
14"x19" Fay automatic lathe
15" Sundstrand automatic lathe
Gisholt Simplimatic

BROACHES

No. 1 Foote Burt hydraulic surface
Twin 10 Oilgear hydraulic
No. 2S Oilgear hydraulic
No. V2 American vert. hydraulic
No. 3 Lapointe double screw
No. 2 Standard screw press

DRILLS

Sensitive, all makes and types
21" Canedy Otto (New)
20", 21" & 24" Cincinnati upright
20" Barnes box Column mfg.
22" Barnes 2-spindle, all grd., self oiling
4' Western radial, Timken bearing, M.D.

GEAR CUTTERS

No. 12 Barber Colman hobbers
No. 12 Bar. Col. long bed splining
Nos. 7 and Z1 Fellows shapers
No. 16HS Gould & Eberhardt hobbers
No. 1 Lees Bradner hobbers
64"x20" G & E spur gear cutter
26"x6" G & E spur gear cutter
11" Gleason straight bevel, segments & Gears
15" Gleason spiral bevel pinion and gear roughers
18" Gleason bevel testers and lappers
8" Red Ring spur gear lapper
Cimatool "Peerless" gear chamferers
Lipe 2-spindle gear chamferer

GRINDERS

No. 2 Cincinnati centerless
No. 72A3 Heald Sizematic
No. 1 G Grenby Internal
No. 75 Heald Internal
Heald No. 72 automatic electric sizing Internal
12"x36", 16"x36" & 16"x52" Landis
6"x20", No. 10 & 6"x32" No. 11 B.&S.
Nos. 1 & 2 Brown & Sharpe universal
10"x18", 10"x30" & 10"x50" Norton
18", No. 6 Besly opposed disc
20" Gardner semi-automatic disc grinder
Ingersoll face milling cutter grinder, type EN85
Cincinnati face milling cutter grinder
Gisholt tool grinder
16"x32" Landis crankpin
No. 10 Blanchard surface
No. 1½ Cincinnati tool & cutter

FORGING EQUIPMENT

No. 2B Nazel air hammer, motor driven
No. 1 Evans Ajax taper forging roll
3" Acme upsetter (forging machine)

LATHES

12"x8' Sebastian
14"x6' Mulliner
15"x6' Sebastian
18"x6' Reed Prentice
18"x8' Boye & Emmes
24"x12' Boye & Emmes
28", No. 3B Foster turret
22" & 26" Libby turret
28" Gisholt turret
8" and 12" Sundstrand Stub
15" Sundstrand automatic stub

MILLERS & BORING MILLS

2½" Universal horizontal mill
3¼" Blomquist Eck horizontal mill
4½" Universal horizontal mill
5" Barret cylinder borer
No. 3-B Milwaukee vertical miller
No. 3 Reed Prentice vert. miller & die sinker
No. 2 Cincinnati plain
No. 4—36 Cincinnati Hydromatic
No. 3 Sundstrand bed type mfg. miller
48" Oesterlein tilted offset miller
42" Ingersoll continuous rotary
Type C Hall planetary thread miller
48" Newton C66A cont. rotary
No. 4 Lees Bradner univ. thread
4" Rice Barton double spline

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MILES MACHINERY CO.
SAGINAW, MICHIGAN

Ready For Shipment

AUTOMATICS:

B & S #00, #0 & #2
Gridley 3¼", 4¼" 1 sp.
Potter & Johnston #6C Chuckers
Goss & Deleouw Chucker
Cleveland 2" Model K, 4 Spindle New 1937
New Britain-Gridley Model 60—1", 6 sp., New 1941

BORING MILLS:

Cleveland 2½" Bar Horiz.
Bullard 36" Vert. Turret
Bullard 36" Rapid Production
Bertram 42" Vertical
Bullard 100"—2 Head—M.D.

DRILLS:

N-B-P 5' Radial, Motor on Arm
Niles 7' Radial
Cincinnati-Bickford 6' Radial
Pratt & Whitney Gun Barrel Drills & Rifters

GEAR CUTTERS:

Brown & Sharpe #3—26"
Fellows #64
Fellows Gear Burnisher
Gleason 6" Generator
Detroit Gear Grinders

GRINDERS:

Brown & Sharpe #3—26"
Baxter D. Whitney #23 Cylinder Grinder, Like New
Brown & Sharpe #11 Plain
Heald #70-A Internal
Heald #72-A-3 Sizematic, New 1940
Blanchard #10-26" M.D.
Norton 15"x15"x72" Surface
Hanchett Type 300 Size 48 (12"x48") Vert. Sp. Hyd. 99% new
Sav-Way Internal
Brown & Sharpe #3 Univ.
Bath 10"x25" Univ.
Cincinnati 12"x36" Univ.
Landis 20"x120", 20"x144" Plain Grinders
Cincinnati #1½ Tool & Cutter
Norton #2 Tool & Cutter
Pfauter Hob Grinder
Bryant #3B, 6, 12, 18 Internal
P & W 14" B.B. Vert. Surface, Model B
Farrel Roll Grinder

LATHES:

Hendey 12"x5'
Monarch 14"x6'
LeBlond 14x6'
Sidney 17"x8'
Lodge & Shipley 20"x8'—G.H.
Johnson 30"x24'

MILLERS:

Sundstrand #1—18" Rigidmil, New 1938
Cincinnati #5 Plain SPD
LeBlond #3GH—Plain
Rice-Barton Spline Millers
Becker #4B Vertical
Cincinnati #3, #4 Vertical SPD
B&S #3 Vertical SPD
Becker Model C, Vert.
Waltham Bench Thread Miller
Rowbottom Cam Miller
P & W 5", 12" Automatic
Pratt & Whitney 2" Spline Duplex
Cincinnati 12" B.G. Mfg. Becker #7H Lincoln

MISCELLANEOUS:

Boring Machine—Coulter Diamond Borer
Chambering Machine—Pratt & Whitney
Chucking Machines—Potter & Johnston #6-C
Header—W-F ¾" Ball
Header—W-F #1 & #2—SSSD
Shaper—P & W 6" Vertical
Shear—Marshalltown #38 Rotary Bevel, M.D.
Tapper—Threadnut #2
Swager—Dayton #3½
Thread Roller—W-F½" cap.
Upsetter—Acme 2" Steel

PLANERS:

Cincinnati 48"x48"x20', 3 Head
Gray 84"x72"x18', 4 Head

PRESSES:

W-F 20 Ton Rack & Pinion
Robertson 170 Ton Hyd. 16' High

BOTWINIK BROTHERS, INC.
373 Welton St., New Haven 9, Conn.

CLOSEOUTS

BORING MILLS
HORIZONTAL

2½", 4" Binsee
4" Landis Horiz., Floor Type, M.D.

VERTICAL

66", 120" Niles
42" Bullard, M.D., 54" Colburn, M.D., 2 hds.

TURRET LATHES

Nos. 2A, 3A W.&S. 4½" hole, M.D.
24" Gisholt, 6½" hole
Foster Nos. 4, 5, 6, 1B, M.D. Univ.
J. & L. 2¼x24", 3¼x36"
Acme 3¼" M.D.

GRINDERS

P. & W. 14", 18", B.B., Vert., M.D.
Blanchard 30", M.D.; Modern 12x48", M.D.
Norton Hydraulic 12x18", M.D.
Heald Nos. 55, 70, 72A3 Gagematic, M.D.
Norton 50"x28', M.D.
Gardner 72' disc, M.D.
Landis Type A 6x20" Hydraulic, M.D.
Bryant No. 12, M.D.
Nos. 50, 55, 60 Heald Int. Hydraulic, M.D.
12" Heald Rotary, M.D.
B. & S. No. 2 Surface, M.D.
Norton 10x36" Hydraulic, M.D.
Badger 24" Dbl. Opposed, M.D.
B. & S. No. 10, 11 Cyl.
No. 2 Cincinnati, Centerless, M.D.
B. & S. No. 1, 3 Universal

LATHES

McCabe 26-42"x14'
24x12' Boye & Emmes 3 step cone, D.B.G.
20"x14' Rahn-Larmon, raised to 24"
14"x6' Hendey
9" LeBlond Automatic
36x30' Putnam, M.D.
36x22' Putnam S.C.G., D.C.M.D.
32"x35' Wickes
Putnam 42x16', M.D.
30x26' L. & S. 12 speed M.D.
84"x28' Niles-Bement-Pond, 17' centers
P. & W. 1x18, 1¼x18 Automatic Lathes

AUTOMATICS

B. & S. No. 2, 6, 6F Hand Screw
B. & S. No. 00, 0, 2, OG
5 Spdle Davenport 9/16" cap.
Cleveland Model A ½", ⅝", 1¼", 2"
Cleveland Model B 1", 2"
Gridley 4¼" single spindle, M.D.
P. & J. 6A, M.D.
⅞" Cone 4 spindle
Gridley ⅞" 4 spindle

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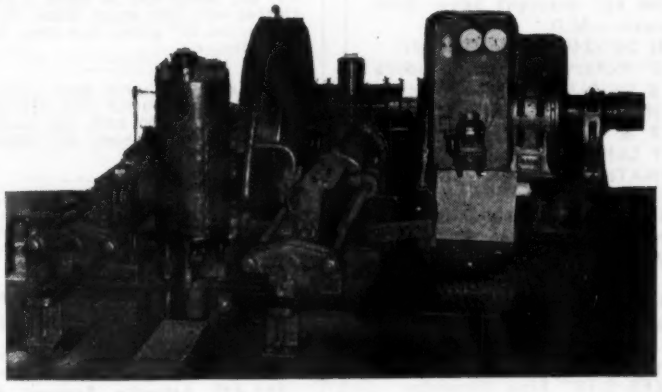

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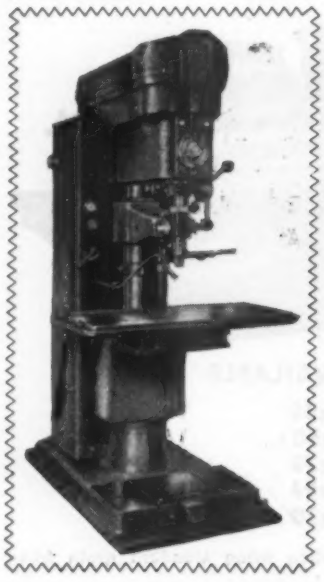

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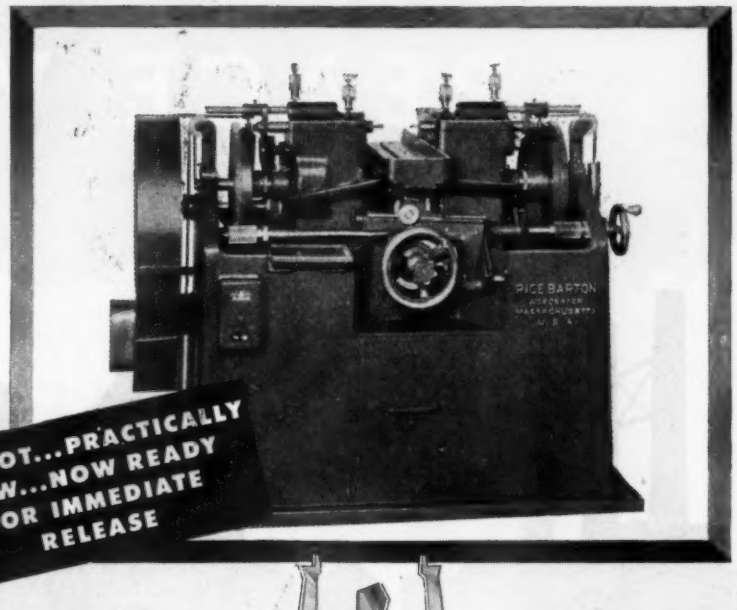

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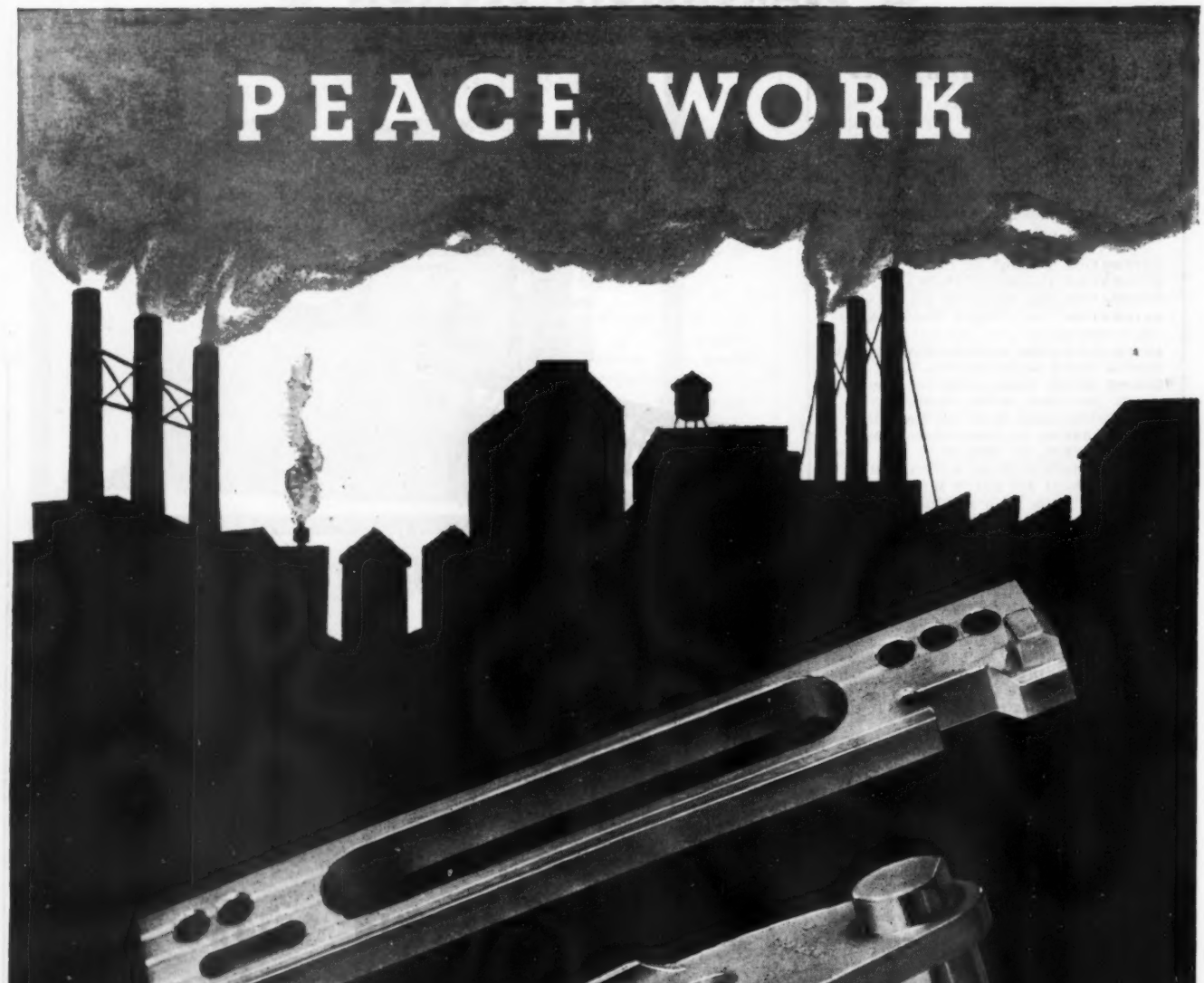

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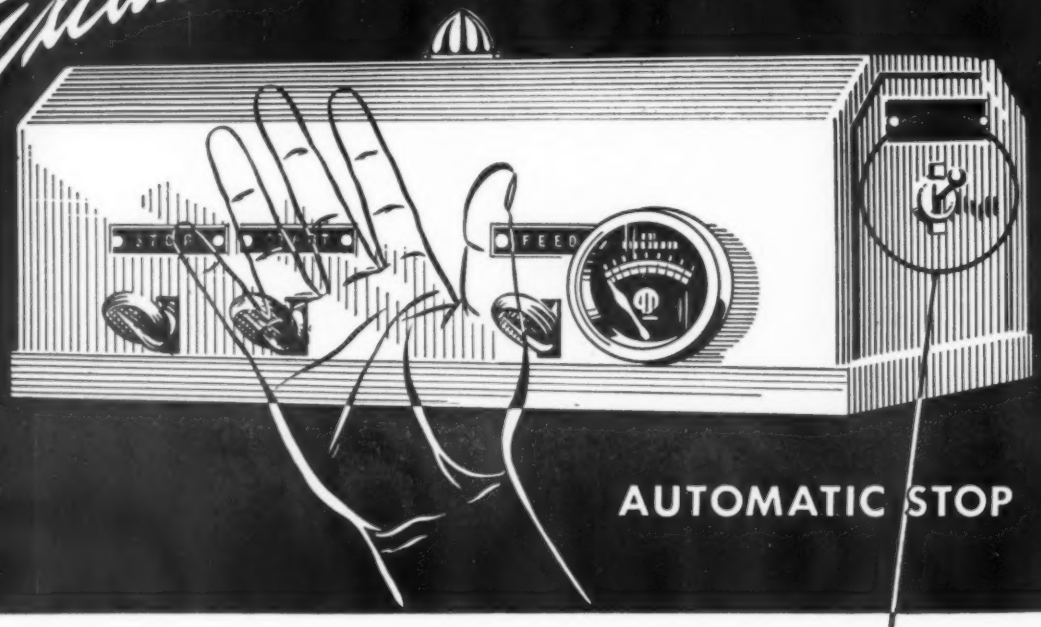

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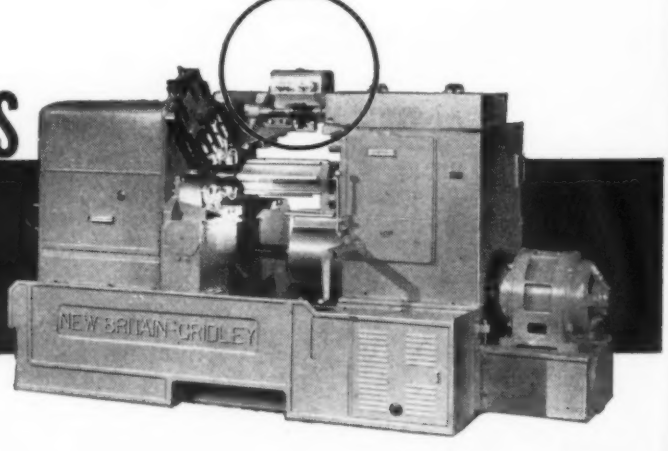

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